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AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1830.

Specifications of American Patents.

Specification of a patent for an Improved Cooking Grate, and its Appendages; intended chiefly for cooking by means of Anthracite Coal. Granted to Thomas Vinton, *of Philadelphia, Pennsylvania, October* 31, 1829.

Be it known that I, Thomas Vinton, of the City of Philadelphia, in the State of Pennsylvania, have made certain improvements in the cooking grate and its appendages, intended, chiefly, for cooking by means of anthracite coal, and that the following is a full and exact description of the same, reference being had to the drawing which accompanies this specification, and which makes part thereof.

The general construction and form of the grate may be the same as those in ordinary use, and it is to be lined with fire brick, in the usual manner; considerable variation, however, may be made in the arrangement of those parts which I esteem as new, without, in any degree, varying the principle upon which my improvements are founded.

Fig. 1, in the accompanying drawing, (Plate 1,) is a perspective view of the grate, set in a common fire-place, the brick lining being omitted for the purpose of more perfectly showing the parts formed of iron.

Fig. 2, is a plan, the same letters of reference being employed in each to designate similar parts.

A, is an oven on one side of the grate, and B, a boiler on the opposite side.

C, C, are boxes formed of cast iron, with small grates, or bars,

exposed to the open fire, to admit heated air, which passes into the spaces that surround the oven and the boiler.

D, D, D, are pipes, with registers, for conveying off the heated air from the oven, and the air chambers.

At E, are two openings for the admission of cold air; through one of these it passes into the cast iron tube, F, which is, on one side, exposed to the direct action of the fire, as it stands flush with the fire brick, in its passage through the grate: this tube opens into the oven at G; through the other opening cold air passes into the air chamber, R, behind the fire, where it becomes heated, and is admitted into the back part of the oven at S. To allow of the escape of the heated air, the short pipe having its opening at H, communicates with the oven, whilst the larger pipes, in the back angles, open into the air chambers which surround the oven and the boiler, and extend up the chimney, five or six feet; these establish a draft through the grates in the boxes, C, C, and the air chambers. The portion of ashes which may be drawn in through the grates, may be removed at the ash pit doors, I, I, which are made to fit closely, to prevent the admission of cold air; and the registers, J, J, J, in the heated air pipes, serve to regulate the draft through them, with the utmost facility. The cock, K, is for drawing water from the boiler, which is intended to be kept supplied with water. The cock may be made to unscrew for the purpose of removing the boiler, when desired.

L, L, L, in Fig. 2, are the fire brick, not represented in the perspective view. The boxes C, C, extend within the grate, so that their fronts are flush with the brick, when the grate is lined; this is also the case with the tube F.

M, is a sliding blower, which, although not necessarily appended to the fire-place, is of great utility.

N, N, N, are the bars of the grate; the basket part being omitted in order to show, more perfectly, the boxes C, C, and the tube F.

O, O, are the stiles which connect the ends of the bars of the grate; there being spaces without these stiles, to allow for the expansion of the bars, by heat.

P, P, are perforations in the back plate, and in the hearth; the perforations in the back plate, are for the admission of heat through the plate, and to allow of the expansion and contraction of the plate, with less danger of fracture than when solid.

Q, is an aperture leading from the fire, to the space over the oven, and which may be closed at pleasure.*

R, is an air chamber at the back of the grate, which is distinct from the chambers that surround the boiler and the oven; the latter being, in general, situated at the outer side, and above and below, but it may be extended to the back, and to the side exposed to the fire, if preferred.

The grate, with its appendages, is to be placed in an open fire-place, with a crane for the purpose of hanging kettles, &c. in the usual manner, whilst meat may be roasted in front, without interfering with the other operations.

* The letter Q, is omitted in the engraving.

What I claim as new, and as my own invention in the above described grate, is the pipe F, with its openings, and the chamber R, by which air, heated by the fire, is admitted directly into the oven; and also the boxes C, C, with their openings, for admitting the air, which has been heated by passing through the fire into the spaces surrounding the oven, by the aid of which the operation of baking is readily and perfectly effected. THOMAS VINTON.

References to the Drawing of Thomas Vinton's Cooking Grate, Plate 1.

Fig. 1. Perspective view of the grate, set in a common fire-place; the fire bricks at L omitted.

Fig. 2. Plan of the grate.

A, oven.

B, boiler.

C, boxes containing small grates admitting and conducting heated air from the fire around the oven and boiler.

D, pipes with registers.

E, openings for cold air, one communicating with the oven at G, through the tube F, and passing out at the pipe H; the other communicating with the air chamber R.

I, doors to ash pits.

J, registers.

K, cock communicating with the boiler.

L, fire bricks.

M, sliding blower.

N, bars of the grate; the basket part omitted to show the boxes and tube.

O, stiles connecting the ends of the bars.

P, perforations in the back plate and hearth.

Q, aperture leading from the fire to the space over the oven.

R, air chamber communicating with the oven at S.

Remarks by the Editor.—Experience, the best test of the worth of either persons or things, has, so far as it has come to our knowledge, been altogether in favour of the apparatus above described. An intimate friend in Philadelphia, whose family is large, and in whose word and judgment we have entire confidence, has had Mr. Vinton's grate in use for some time, and is too well pleased with it to be willing to return to the wood fire for the purpose of cooking, or, indeed, to any other mode with which he is acquainted. At a very early period this grate achieved a signal triumph in his family; it not only silenced the opposition made to the trial of it, by the occupants of the kitchen, but has converted them into zealous advocates, as they find it to answer the purposes intended in a very perfect manner, whilst it possesses that valuable attribute of an anthracite coal fire, the requiring so little attention to keep it up.

Meat baked in the oven, we are assured, cannot be distinguished, by the epicures, from that roasted before the fire; the surface is well browned, and the gravy unburned. Bread, and the various ar-

ticles of pastry, are baked as well as in a brick oven, the heated air communicating a much more equable temperature to the plates of the oven, than a direct fire. We have not, ourselves, seen the grate in operation, or tasted of the savoury viands which it sends forth, we should not, therefore, have ventured a decided opinion in its favour, had not its character been furnished by those who have no personal interest in bringing it into notice.

Those grates which have hitherto been put up, have not been furnished with boilers. With the appendages, such as bars of wrought iron to place kettles, &c. above the fire; a trivet, or shelf, in front of the grate, and the fire brick; the cost of them is thirty-five dollars. When a boiler is added, this of course will increase the price in proportion to its size, and the material of which it is made, as of tinned copper, or iron. The cost of a sliding blower, and the work in fixing it, is not included, as not being essential to the use of the grate. The quantity of coal used is said to be about the same as that for an ordinary parlour grate.

Mr. Vinton has published the subjoined directions, for the use of those who employ his cooking stove.

"*Directions for making a Coal Fire, and for using the Cooking Apparatus.*

"1. Anthracite coal, when broken into pieces from the size of a hen's egg to that of a common sized tea-cup, and free from dust, will burn freely, without the aid of a *blower*, if left to kindle, and but a small quantity of coal is added at a time. The fire also, will, in this case, be much clearer and stronger.—Dry wood, or charcoal, should be used for kindling it.

"2. The blower will facilitate the kindling of the fire in the morning, and at other times when it is low, *but it should be used sparingly;* for when used but a short time, the heat becomes so intense as to melt the ashes and stony substances found in the coal, and form a cement, which prevents the free circulation of air, and the fire soon becomes dull and sluggish. Whenever this is the case, the whole mass should be broken up, by putting the poker under the basket part of the grate, between the bars, and lifting the coal; or by passing it between the front bars and prying the coal up. The first method is the best; as it not only lightens the coal, but frees the grate from ashes. The looser the coal lies in the grate, the brisker will be the fire.

"3. Should the fire become dull, after the coal is ignited, *it is a sure indication that it is clogged* with the cement before mentioned, with ashes, or coal dust, or that there is too great a quantity in the grate; in either case, instead of running down the blower, which will only increase the difficulty, free the grate in the manner directed in the foregoing section.

"4. For roasting or baking, *it is necessary that a large proportion of the heat should be in the basket, or lower part of the grate;* keep that part, therefore, free from slaty and stony substances, and from the remains of melted cement, or these will, in a short time, when

VINTON'S COOKING STOVE

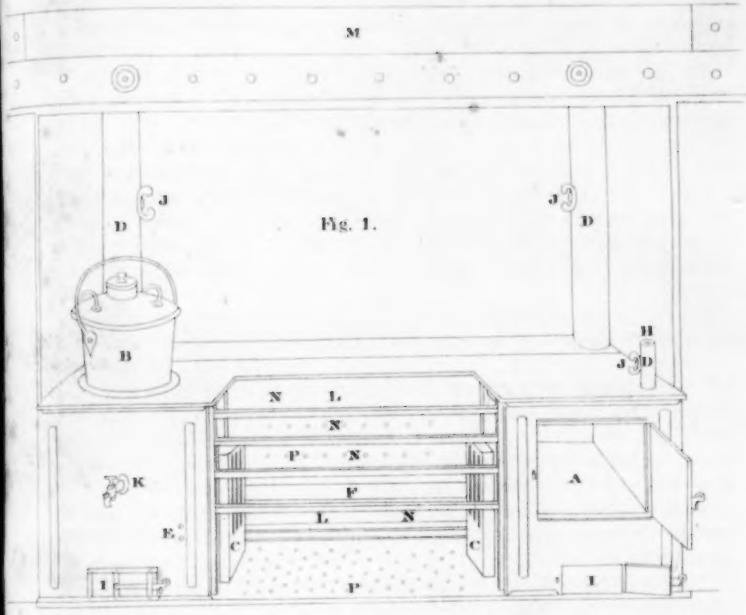

Fig. 1.

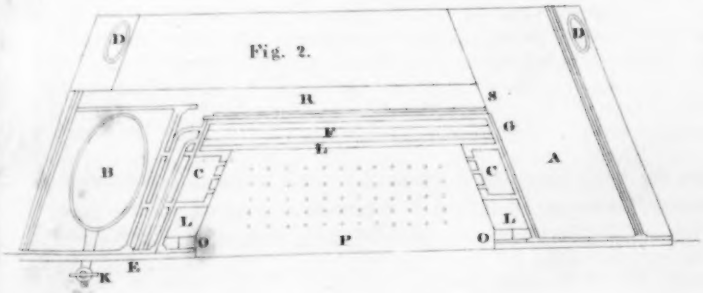

Fig. 2.

the coal is very impure, occupy the space which should be filled with pure coal and active heat. The pieces of slate, stone, or cement, which are too large to fall through the grate, should be taken out with tongs.

"5. Permitting water to boil over, or to be spilled on the fire bricks, will cause them to crumble, and should it reach the cast iron pipe between them, in the back part of the fire-place, or the small grate at its end, it may cause them to bend or warp. Exposing them when heated, to the action of cold air, will also have the same effect, and it is, therefore, necessary that the fire go out gradually, and never be taken all out at once.

"6. For all the purposes of a common family, it is not necessary to have more coal in the grate than will come to a level with the second bar from the top. A larger quantity is a useless and injurious weight, which presses that below it so closely together, as to prevent a free circulation of air. Putting cooking utensils or other weight on the fire, will also deaden it.

"7. A small quantity of coal, in pieces about the size of a walnut, put on the top of the fire, while baking, will be useful to keep the heat from ascending.

"8. Sprinkling a small quantity of coal dust or ashes, on the fire at night, will preserve it until the next morning, when there will be sufficient heat to kindle fresh coal or wood.

"9. Scrape out the *ashes from the ash pit* every morning.

"10. Whenever the bottom plate of the oven becomes too much heated, the heat can be shut off, in part, or wholly, by altering the register in the flat pipe; in like manner, should the oven become too hot, raise the register in the tube on its top—this will also cause the circulation of heated air through it. A thin fire brick placed on the bottom plate of the oven, will be useful to bake articles on, which are sweetened—this will prevent their being burned.

"11. By lowering the blower to within 15 to 18 inches of the top of the grate, and placing the fender before the fire, the greater part of the heat will be taken up the chimney. The object of this, is, to prevent the kitchen from becoming heated in the summer.

"12. The foregoing directions being attended to, the use of coal will, after a little experience, be found to be preferable to wood, and not one half the labour is requisite to keep the fire in order."

Specification of a patent for a "Pendulous Rail-road Car," for running or moving upon rail-roads. Granted to SAMUEL T. JONES, *Philadelphia, Pennsylvania, February* 22, 1830.

To all whom it may concern, be it known, that I, Samuel T. Jones, of the City of Philadelphia, in the State of Pennsylvania, have invented an improved car, which I denominate the Pendulous Rail-road Car, for running or moving upon rail-roads, in which are combined, simplicity of construction, facility of being loaded or unloaded,

and of turning upon a curved road; and that the following is a full and exact description of my said invention, or improvement.

The body of the car may be constructed of iron, wood, or any other suitable material, and in any form which may be preferred. This I suspend upon two wheels, which is the distinguishing feature of my invention. In order to effect this, I suspend the car in such way, that whether loaded or not, the centre of gravity of its body, when in its upright and proper position, must be below the point or points of suspension. An axle common to each wheel, and revolving with them, may be made to pass over the top of the car, or through the sides thereof; and in the last named case, should be enclosed within a box or tube, extending from one side of the car to the other, to protect the axle from being obstructed in its motion by the load; or, a frame may be made of wood, or other material, which shall surround the car, so as, on each side, to receive a wheel between two cheeks, so that its axle or gudgeons may be carried and revolve in proper boxes contained in, or attached to, said cheeks; the car being attached to and swinging with the frame, upon the axles or gudgeons as joint bearings. Instead of attaching the points of suspension directly to the sides of the car, I intend, sometimes, to extend a spring, or a bar, along each side of its body, and firmly affixed thereto by its two ends, and to make this spring, or the bar in its central or middle part, the point of suspension; in which case the bar is intended to operate as a spring, and to lessen the vibration of the various parts of the car.

When the car is at rest, for the purpose of being loaded, or unloaded, bolts or props may be made to shoot out, or to turn down, from the ends or sides of the body of the car, and to rest either upon the rails, or path, so as to hold the body steady; these, when desired, may be made to project sufficiently to tilt the car towards either end, and thus bring it nearer to the ground, to facilitate the loading or unloading. These props may be constructed in various ways, two of which are shown in the drawings deposited in the patent office.

The wheels of these cars may be made five or six feet in diameter, and still the load may be lower down than in ordinary rail-road carriages, or even more than this, and the same purpose be effected.

The cars may be attached to each other, so as to form a train, by bars or chains, in the usual way, but in order to lessen their vibrating, or pendulating, upon their points of suspension, when in progressive motion on the road, and to increase the steadiness of the wheels upon the rails, I intend, in general, instead of chains, to attach them by a clevis, which shall work in loops, or eyes, in the ends of the cars, so as to allow of a horizontal hinge motion, at one end of the clevis, and permit the cars to turn readily upon a curve in the road, thus acting like the bolt in the bed of an ordinary carriage or wagon.

Friction wheels of the various forms now in use, may be employed and attached in the ordinary way, which, making no part of my invention, I do not describe. What I claim as new in the above described cars, is the adaptation of a two wheeled vehicle to a rail-road,

by suspending the body of the car, and its load, so that the centre of gravity may be below the points of suspension, and the car thereby made to hang in an upright position by its own weight; of being tilted towards either end for the purpose of greater facility in loading or unloading, and answering other useful ends.

SAMUEL T. JONES.

References to the Drawings of Samuel T. Jones' Pendulous Rail-road Car, Plate 2.

Fig. 1. The flanches are here supposed to be on the inner edges of the wheels, and the wheels running in a frame, *a*, *a*, *a*, *a*, without an axis common to both wheels. *b*, *b*, bolts or props, to steady, or tilt the car, whilst loading or unloading.

Fig. 2. In this the axis crosses the car, and is boxed over. *d*, *d*, show sliding bolts or props, to answer the purpose of those at *b*, *b*, Fig. 1.

Fig. 3. Is a form in which the clevis, to connect the cars, may be made; the three shanks dropping into tubes, or loops, two into one, and one into another car. The loops are seen at *e*, *e*, *e*, Figs. 1 and 2.

Specification of a patent for modes of adapting Rail-way Cars, or Carriages, to run on ordinary roads or streets, and also of enabling Carts, Wagons, and Carriages of various kinds, to run securely upon rail-roads. Granted to SAMUEL T. JONES, *of Philadelphia, Pennsylvania, February* 22, 1830.

To all whom it may concern, be it known, that I, Samuel T. Jones, of the City of Philadelphia, in the State of Pennsylvania, have invented a new and useful mode or modes of adapting rail-way cars, or carriages, to run on ordinary roads or streets, and also of enabling carts, wagons, and carriages, of various kinds, to run securely upon rail-roads; and that the following is a full and exact description of my said invention.

The main difficulty in converting a rail-road car or carriage into one for common roads, is the structure of the wheels, which, on rail-roads, require flanches, or some substitute therefor, which renders them unfit for other roads; and, in like manner, carriages for ordinary roads, for want of these appendages, will not run upon rail-roads. To obviate these difficulties, I have invented and adopted the following plans, which may be applied either to my pendulous rail-road car, or to any other car, or carriage, for rail-roads.

I sometimes make my wheels without flanches, and instead thereof, use friction rollers fixed upon, or adapted to, suitable arms or bearings, extending down to the rail, so that the rollers may bear against its side, and perform the office of a flanch. The application of friction rollers is not new, but instead of making the arms, or bearings, or the rollers, fixtures, I construct them so that they may slide up, when the car or carriage is about to pass off the rail-

road, and bring the rollers nearly or quite into contact with the body of the car; or to swivel upon a joint or joints, so as to turn up on the ends of the car or carriage, and in these positions be secured by any convenient means, so that they will not be liable to meet the usual obstructions on the surface of the common roads. These may be fixed in various ways, two of which, deemed by me as among the most eligible, are represented in the drawings deposited in the patent office. Sometimes I construct the axles of the friction wheels, or rollers, so that they may easily be withdrawn from the bearings, and remove the wheels or rollers only, without disturbing the arms or bearings, for said purpose.

The novelty which I here claim, is the attaching the arms, bearings, or axles, which carry the friction wheels or rollers, in such way, as that they can be readily removed, and thus prevented from coming into contact with the ground, which they would if they were fixtures, in their usual acting position, when desired to pass off the rail-way.

Another mode by which I convert the rail-road car or carriage into one for common roads, is by using them with flanches to the wheels, of nearly the ordinary form, but which also are capable of being removed, or unshipped when they are to pass off the rail-road. This may be effected by screws, bolts, buttons, spring catches, or other means equally easy and secure, to which I could lay no claim, my invention being simply the removing or attaching the flanches for the purpose above specified.

It will readily be perceived that in this case, the flanch is to be disconnect and separate from the tire or band surrounding the wheel, which latter is intended to be a fixture. The flanch may be either of cast or wrought metal, but in this, and in all cases wherein the car or carriage is to be adapted for passing off the rail-road, if the wheels are of wood, I recommend the tire or band aforesaid to be of rolled or wrought metal.

A simple and easy mode of securing the flanches to the wheels, and allowing of their removal without loss of time, is the following. A suitable number of holes are to be made in that part of the hoop, or ring, which covers the side of the wheel, and of which the projecting part, when on, forms the flanch. On the side of the wheel, there are to be a corresponding number of hooks, catches, or buttons, which will pass through said holes, so that when the flanch is hung upon them, they will hook or lap over the outer edge of the holes, by the falling of the flanch into the hooks or notches, or catches, prepared for that purpose; a single bolt now passed through the flanch or rim, and wheel, and secured by a nut, catch, or key, will secure the whole firmly together, and also allow of their being separated again with the utmost facility. The hooks, catches, or buttons, may, if preferred, be fixed upon the flanch piece, and pass into holes in the wheel, and there lap into and become tied, and then be secured by a single bolt passing through the flanch or rim, and wheel, as before mentioned. The hooks or catches may themselves be made to take off, when the car or wagon is intended to leave the rail-road.

Where frequent shifting is not necessary, bolts and nuts may be

used, instead of any other contrivance. The hooks or catches before named, may be made to tighten upon the flanch by means of nuts. I do not, however, confine myself to the modes designated, but to secure the flanch by any method by which this can be readily done, and at the same time admit of its easy removal.

In order to adapt common carts, wagons, and other similar vehicles, or pleasure carriages, to rail-roads, when the faces, tread, or tires of their wheels are sufficiently true, and of a proper width to run or move upon rail-roads, I attach either moveable friction wheels, or flanches to them, as above described, and affix them either on the outsides or insides of the wheels, according to the structure of the rail-road on which they are to run.

When the wheels are in any way defective or deficient in the face, or tread, for running upon a rail-road, I place a rim, covering the face of the wheel, and also forming a flanch, so as to enclose and surround the wheel, and give to it the form and attributes of a wheel for a rail-road, and attach and secure it to the wheel by means similar to those already described. In case of a wagon or other ordinary four wheeled carriage being adapted to a rail-road, the fore axle which works upon a pin or bolt, may be secured to the carriage, by another bolt or tie, so as to convert it into a fixed axle.

I intend sometimes to widen the edge of the ordinary flanch, so that when it leaves the rail, the edge shall serve as a tread, or face, for ordinary roads.

What I claim as new, and as my invention or discovery, is the attaching a moveable flanch or flanches, or of shifting friction rollers operating as flanches, to rail-road cars or carriages, in lieu of fixed ones as at present employed, for the purpose of adapting them to rail-roads when the rollers or flanches are in their places, and to common roads when they are removed; and also the attaching of such rollers, and flanches, or a complete rim forming a face, or tread, and flanch to carts, wagons, or carriages, intended for ordinary roads, so as to fit them for running upon rail-roads. I likewise claim the widening the edge of the flanch so as to become a face, or tread, suitable for streets, or common roads. SAMUEL T. JONES.

References to the Drawings of Samuel T. Jones' Rail-way and Road Carriage, Plate 2.

Fig. 4. *a*, *a*, the sliding piece sustaining the rollers, *b*, *b*, which act against the side of the rail.

Fig. 5. *d*, *d*, pieces which swivel on pins and carrying rollers *e*, *e*, which may be turned up on the ends of the car, and secured by screws, or otherwise.

Fig. 6. An end view of these pieces, with their rollers connected by the bar *f*.

Fig. 7. A mode in which friction wheels, with bevilled edges, may be applied, and slide up by the bolts *g*, *g*.

Fig. 8. A moveable flanch with perforations at *h*, *h*, *h*, to latch, or catch upon *i*, *i*, *i*, in Fig. 9; *k*, in Fig. 8, is a bolt, the shank of

which passes through *b*, in Fig. 9, and is seen at *m*, in the edge view of the wheel, Fig. 10, one of the hooks, or latches, being shown at *n*.

Fig. 11. Shows how the flanch may be widened, so as to become adapted to serve as a face, or tread, on ordinary roads.

Remarks by the Editor.—From frequent conversations with the gentleman who has obtained the two preceding patents, we have been fully informed of the advantages which he anticipates from his inventions. Most of these are apparent from the tenor of the specifications, particularly of that for enabling carriages to run either upon rail, or common roads. In the pendulous car, it is believed, that by substituting wheels of from 5 to 6 feet in diameter, for those of 2 or 2½ feet, as now employed, the motion of the car will be much more steady, and attended with less jolting at the joinings of the rails, as those inequalities will be much more readily surmounted, which, though small, are inseparable from structures of this kind, and produce a perpetual vibration. The friction on the axle will also be decreased in proportion to the increase of the size of the wheel, and the extent of rubbing surface will also be lessened from the cars resting upon two bearings instead of four. The ease of loading and unloading will be greater than in the common car, as, notwithstanding the size of the wheels, its body may be placed nearer to the ground than has heretofore been practised, and by means of the bolts or props, one end be brought into direct contact with it. It is not believed that, on a rail-road, any inconvenience would be experienced from the pendulous motion of a single car. This, however, is a point of little importance, as a single horse would, of course, draw several of them, and the mode of connecting them would prevent all vibration upon their axes, whilst it offers every facility to their adapting themselves to any curve.

The capacity of each car may be nearly, or quite the same as those with four wheels, and from the weight hanging so much below the axle, the lateral strain upon the wheels will be greatly lessened.

Specification of a patent for a Tide Power, or the application of the power of tide water, connected with the principles of Buoyancy and Gravity, for the purpose of applying power to machinery, or any other required use. Granted to HENRY M. WESTERN, *New York, December* 23, 1829.

THE object which the subscriber purposes to effect, is to bring into value and use the rise and fall of the tide water on the sea board, and particularly in the principal cities of the union, to be employed in manufacturing, and other purposes.

The plan in which this object is to be effected, is by the use, or construction, of vessels, or floats, of great weight and buoyancy, so that, in the instance of the fall of the tide, by their weight, or the weights contained in them, and in the rise of the floats, by their float-

ing, they may apply, both ways, a force proportioned to their weight and magnitude; and which, being connected to a lever, or beam, may be applied to driving, or putting in operation, any species of machinery, and thereby saving animal, steam, or other powers, and possessing the very important advantage of contiguity to the marts of the manufactured article.

The invention may be put in use by the affixing of a condemned, or other hulk of a ship of required size. Or floats, with proportionate weights in them, properly affixed in one of our usual slips, or in any tide water, and the beam, or lever, extended into a building projecting over it, or by the side of it, or on the side of streets fronting on the slips, and in other situations contiguous to the tide water; the extent of the power to be regulated by the size and weight of the float. HENRY M. WESTERN.

Remarks by the Editor.—The power to be obtained upon the foregoing plan, supposing such an arrangement to be made as shall place it all under command, may readily be computed, its elements being the weight which rises and falls, and the distance of this rise and fall, with every tide. It is not, however, to this point that we intend to direct our remarks, but to the question of the form which the specification assumes. A patent cannot be sustained for an abstract principle, and it is incumbent on a patentee to furnish such a practical description as shall enable a person of skill to carry the thing patented into operation. Is this the case in the foregoing specification? We think not; for ourselves, we should feel that the first thing we had to do in carrying it into effect, would be to invent a mode of doing so. The words of the law, are, "And in case of any machine, he shall fully explain the principles, and the several modes in which he has contemplated the application of the principle, or character by which it may be distinguished from other inventions; and he shall accompany the whole with drawings and written references, where the nature of the case admits of drawings." As in this case there are no drawings, no machine is patented; what then is left to be claimed, but the mere principle of obtaining motion from the rise and fall of the tide? This power the patentee claims to apply to machinery, "or any other required use." It has been repeatedly applied to use in raising sunken vessels, and in removing rocks, and other obstructions, from the bottoms of rivers. If, therefore, the claim is intended to be made abstractedly, it seems to us that it cannot be sustained.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1829.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in *Propelling Vessels* of every description by means of INSIDE PROPELLING LEVER WHEELS, with

the assistance (at pleasure) of the wind-and-steam-assisting-ship-pipes; John James Giraud, Baltimore, Maryland, December 1.

We have read the description, and examined the drawing of the above named apparatus, but have been unable to understand the views of the patentee. Sometimes we have thought that we had caught a leading idea, but on finding that it was essentially visionary or absurd, we have dismissed it, choosing rather to submit to the imputation of dulness, than to suspect the inventor of this machinery of having a confused mind, upon a subject to which he must have given much thought, as he has previously obtained two patents for similar objects. There is *a wheel within a wheel*, and there are steam tubes within air tubes, and we believe that, from these latter, it is intended, sometimes, to blow steam, or air, upon the water in which the boat floats, or upon the sails with which she is to be furnished. When a vessel arrives at Washington, propelled by this machinery, we engage to devote all our powers to its examination, and to give a full report of all our discoveries.

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2. For an improvement in Bramah's *Hydrostatic Press;* David H. Mason and Matthew W. Baldwin, Philadelphia, Pennsylvania, December 2.

The patentees say, that "In our improved press the main cylinder, and the plunger, or piston, are constructed as formerly; the principle upon which the instrument acts, also remains unchanged, our improvement consisting in such an arrangement of the forcing pump, or pumps, and its, or their, appendages, as shall give to them greater stability, and render them more compact, and less liable to get out of order, in consequence of the greater simplicity of their parts; thus fitting them the better for general use, and affording them at a reduced cost."

The claim is to "the using of the main cylinder, or the plunger, as a stand, or support, to the forcing pump, or pumps, with their appendages; thereby dispensing with the separate stand ordinarily employed; by which arrangement, one joint suffices for the attachment of the pump, or pumps, without the intervention of a pipe, or tube."

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3. For an improvement in the mode of *Distributing Ink*, and applying the same to the types in letter press printing; John Prince, New York, December 3.

Some idea of the construction of this apparatus may be obtained from the account of its operation, and the claim. Two drawings accompany the description, and give a very clear exposition of the whole structure.

"*Operation.* When the carriage of the press is run in and out by means of the rounce, the spring that communicates the power for taking ink, distributing, and carrying the inking roller over the types, is wound up. "When the tympan is raised, a ketch is lifted, that

lets the spring operate in moving the upper roller over the types, and when put down, is again locked."

"Thus, without any other attention from the workman than that of adjusting the screws for regulating the quantity of ink, the whole business of putting the ink on the types is performed, by simply turning the rounce, and running the carriage out and in."

"What I claim as my invention, and wish to secure by patent, is the above described machine, and the peculiar mode of winding up the spring by means of the rounce in running the carriage out and in, by which motion is given to the inking rollers, and conveying them over the types."

In the number for January, (page 38,) we gave a description of an apparatus for the same purpose, invented by Mr. Stone, of the city of Washington. The principle of operation is essentially different in the two machines, excepting in the circumstance of the inking roller being operated upon by the motion of the carriage. We apprehend that from the number of toothed wheels and pinions employed by Mr. Prince, the friction will be increased much more than in the apparatus as arranged by Mr. Stone. In this case, the pressman will be unable to execute the usual quantity of work, and his opposition to its use, from the increase of his labour, will offer a serious obstacle to its introduction. With any apparatus of the kind, the diminution in the work performed must be proportioned to the additional labour from friction; an essential point, therefore, in such a machine, is the lessening of resistance from this cause.

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4. For an improvement in *Bolting Flour and Meal*, by means of a "Vibrating Bolt;" William Henry Akins, Berkshire, Tioga county, New York, December 3.

Instead of a revolving frame and cloth, as in the common bolter, a box is used of about five feet in length, ten inches in width, and one inch in depth. This box is covered, at top, with strong cloth, and on the lower side with bolting cloth; it is suspended from the top of the bolting chest by means of four ropes, one at each corner. A shaft extends along the outside of the chest, and two pitmen, one at each end of this shaft, give a vibrating motion to the bolter.

The meal is passed into the bolter, through a bag, open at both ends, passing through the top of the chest, and into the upper end of the bolter.

There is no claim made, either general or particular.

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5. For an *Improvement in Distilling;* William Cook, South Port, Tioga county, New York, December 7.

That those acquainted with the various improvements made in the art of distilling, may judge of the *novelty* and value of this improvement, we subjoin the whole specification.

"Let a still be made in the usual manner."

"From the cap of the still, let an arm, or tube, project, which

shall enter into the condensing tub, either at the top, or bottom, nearly; the steam from the still is then conveyed by a tube into the low wines put into the condenser; this steam boils the low wines, and the vapour from the condenser is conveyed by a tube, at or near the top, into the heater, placed at a convenient distance, and is thence conveyed by a worm, through the beer, and also through the cooler, whence the spirits are discharged."

"At the commencement of the operation, strong spirits are produced; afterwards the low wines pass off. These low wines are conveyed to the condensing tub, as before mentioned."

"*Operation.* Charge the still with beer in the usual way; the vapour, or steam, of which passes into the low wines in the condenser, and makes them boil; the vapour from the low wines then passes through the heater, and heats the beer, by means of a tube and worm; they then pass through the cooler by means of another tube and worm, and run off the spirits."

"What I claim as my invention, or discovery, and which I wish to secure by patent, is the condenser containing the low wines, into which the vapour, or steam, from the still enters."

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6. For a *Lever Churn;* William Cook, South Port, Tioga county, New York, December 7.

A handle, like a pump handle, is attached to the shaft of the dasher, and works it up and down, the churn of course being placed below. There is no claim, and we think that this was the best mode of treating the subject, as neither *invention*, or *discovery*, appears to be a term properly applicable to this contrivance.

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7. For *Rectifying Whiskey, Peach Brandy, Apple, and Cider Brandy,* by distillation, and filtration through sand; Robert Mauck, Addison, Gallia county, Ohio, December 7.

The plan proposed, is, to mix common salt with the spirits to be rectified, to distil the spirit off from the salt, and then to filter the liquid through a layer of washed sand, two feet in depth.

The claim is for doing these two things. We recollect having noticed a patent some months ago, in which it was proposed to use salt in the process of rectification; what are its advantages we are at a loss to tell; with respect to the filtration through clean sand, it certainly can do the spirits no harm.

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8. For an improvement in the *Construction, and Mode of Discharging Fire-arms* of various kinds; Robert Eastman, Brunswick, Cumberland county, Maine, December 7.

We intend to give a more particular account of the percussion apparatus invented by Mr. Eastman, as it differs materially from those heretofore proposed, particularly as applied to ordnance.

9. For an improved *Cultivator;* Isaac Cobb, Westminster, Windham county, Vermont, December 7.

This is a wheel plough, with a cultivator, or harrow, placed back of the share, and, consequently, under the handles of the plough. The wheel, we are told, may be removed, when rough ground is cultivated. The description is general, nothing being pointed out as new, and no claim made.

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10. For a *Machine for Shearing the Nap from Woollen Cloth;* Merrit Hurd, Augusta, Oneida county, New York, December 7.

There is no specification accompanying this patent, excepting the drawings and written references be admitted as such. No attempt whatever is made to explain the structure and operation of the machine. We are told, merely, that it is "different in principle, as respects the blades, from any heretofore invented;" and so it may be, but how the blades are constructed we know not. Were we to publish all that appears upon the subject, we apprehend that the *secret* of the patentee would not be thereby divulged.

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11. For a *Machine for Manufacturing Wrought or Drawn Nails, Bolts, Rods, Spikes, Hoops and Screws, of every description;* Shadrach Davis, jun. Dartmouth, Bristol county, Massachusetts, December 8.

The machine described consists of collars running upon two shafts, and working into each other like those of an ordinary slitting mill. Two of the collars which work opposite to each other, the patentee calls die plates, they are notched so that one of them may form the nails, whilst the other is supplied with chisels, to separate their heads and points. Some of the collars are so formed as to allow the bars to be rolled square, to prepare them, we suppose, for the die plates. In the description nothing is mentioned but nails, excepting where we are told that "the machine here described is calculated to manufacture nails, and light work of every description; the proportion of the different parts may be varied to suit the work for which the machinery is intended."

The claim is to "the *die plates*, and the *collars* projecting from and by the die plates, which give a solid square, or other form, to the metal passing through them; and the chisels on the die plates, for separating the heads and points of nails, &c."

Most of the iron now manufactured into round and square bars, is formed by rollers acting like those described. With respect to the *die plates*, it will be no easy task so to form them as to make good nails; and, as to screws, all attempts to make these by rollers have hitherto failed, and these attempts have been numerous; there is an intrinsic difficulty in the thing, which will prevent most practical mechanics from essaying it, and will, we apprehend, disappoint the hopes of those who are sufficiently sanguine to make the trial. "Screws of every description" is a very comprehensive phrase.

12. For an "*Improved Shingle Cutter;*" Joel H. Johnson, Pomfret, Chautauque county, New York, December 8.

"The improved shingle cutter consists of a knife with two edges, about eight inches in length, fastened to a plank of about two and a half inches in thickness," &c. "which may be attached to a saw frame, and cuts, from a block, a shingle as it passes up and down; the shingle falls out on the back side."

There is no claim made; the drawing is very indifferently executed, but serves to give a general idea of the machine, and to show that it bears no distant resemblance to some others for which patents have been obtained.

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13. For a *Metallic Scraper for Excavating Earth under Water;* Oliver Teal, Salina, Onondaga county, New York, December 8.

This machine is simply a scoop, made of sheet iron, of such dimensions as may accord with the power to be employed. It has a handle in one end, fixed like a spade handle, by which it is to be guided. A bail extends from one side of the scoop to the other, and to this bail a rope is attached, by which the scoop is to be drawn forward, and raised up when full. It is to be worked by man or horse power, and, when filled, lifted out of the water by direct strength. We are not told what is new in it, nor is there any claim.

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14. For an improvement in *Percussion Primers for Cannon;* William H. Bell, Lieutenant in the United States Army, Fortress Monroe, Virginia, December 8.

The powder used is the ordinary percussion powder. The primer is made of the thin sheet lead, used in chests of tea; its form, when finished, is that of the segment of a sphere. The claim is to the "making the primers in the form of the segment of a sphere, and in using thin sheet lead to enclose the percussion powder."

It is stated by the patentee, that "these primers have been tested by about 500 discharges of a 24 pounder, with single and double shot, and when used with my percussion lock, produce the utmost certainty of fire in discharging artillery."

Lieut. Bell's lock is not described, nor are we informed what is its particular construction. It may have been the subject of a former patent which we have not seen.

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15. For a *Machine for Elevating Heavy Guns;* William H. Bell, Lieutenant in the United States Army, Fortress Monroe, Virginia, December 8.

The gun is to be elevated by a vertical rack, the upper end of which forms a round head, which acts in a socket at the lower side of the pointing board. An endless screw works into a toothed wheel, which turns a pinion, mashing into the rack. The shaft upon which the screw is formed stands across the gun carriage, and is turned

by a crank. The arrangement is ingeniously devised, and appears to us to be well calculated to answer the purpose intended.

The claim is to "the combination of the parts forming the above described machine, with the application of said machine to elevating heavy guns."

A segment of a circle, and an index attached to one of the trunnions, are to be used to point out the actual angle of elevation.

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16. For an improvement in the common *Turner's Lathe*, for turning of wood, and other substances; Elijah Putnam, Gardiner, Worcester county, Massachusetts, December 9.

This improvement consists in placing cutters, of suitable shapes, upon a wooden cylinder, placed below the piece of timber to be turned. This cylinder is to be supported between the head blocks of the lathe, and is to be made to turn slowly in a direction the reverse of that of the piece to be turned; motion is given to this cylinder by means of an endless screw working into teeth at one end of it. The cutters are to be so placed, that those to take off the rough shall come first into contact with the rail, &c. to be turned, and, in one revolution of the cylinder, the whole of the cutters are to be successively brought up, and the piece finished.

The cutters, it is stated, may be placed upon a slide, instead of upon a cylinder, but the former is preferred.

An apparatus of this kind, can be applied only where numerous articles of the same form are wanted; and work can never be finished by it with that neatness which the gauge and chisel, used in the ordinary way, produces. In fact, it can do no other than rough work, or the stuff used must be of a texture such as we have not met with in our essays in this art.

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17. For an improvement in the *Grist Mill, and in Horizontal Spiral Wheels;* Alexander Temple, Brookfield, Trumble county, Ohio, December 11.

Three stones are to be used in this grist mill, the middle one being the runner; this is in the form of a double cone, the fixed stones being hollowed to receive it. The shaft, or spindle of the runner, is furnished with steel choppers, or breakers, to prepare the grain for entering between the stones. One hopper, with two shoes, supplies the grain which is fed at the apex of each cone, and the meal is delivered at their common base between the two stationary stones; the shaft is to run horizontally.

The improvements which the patentee claims to have made in the horizontal spiral, or tub wheel, consist in some variation in the form of the buckets, and of the issues.

The claim is to the double conical stone; the two breakers working in corresponding hollow cones; the manner of placing the buckets on the water wheel; the manner of moving the damsel by an oval cam, &c.

18. For *Carriages for Rail-roads, and other purposes;* John J. Reekers, Baltimore, Maryland, December 11.

Two pair of wheels, as usual, are to be connected by axles, which are to be cylindrical. Below each of these axles is to be placed a cylindrical rod, or shaft, having pulleys on it; eight are represented in the drawing as placed upon each of these bars; endless chains, ropes, or bands, are to pass round grooves in these pulleys, and over the cylindrical axle of the wheels. The car, with its load, is made to bear upon the lower shaft, and its rollers, with their bands, are intended to lessen the friction.

The particular arrangement cannot be fully explained without drawings, and when we learn that this carriage has gone into successful operation, these shall be furnished. The end attained, as averred by the patentee, is one of great importance, as will be seen by the claim, which is to "the machine, or rail-road carriage, here described, by which the weight of the carriage and load, *act as a pendulum in assisting carriages to ascend inclined planes.* Also the mode of turning carriages on the rail-way, or other roads; and the application of pulleys, wheels, or rollers."

We marvel much in what way a pendulum could be made to assist a carriage in going up hill; the weight, too, "of the carriage and load," also lends its aid, not as heretofore, in descending, but in the reverse direction. Query, will not a double load give double assistance in going up hill? On the second claim, that is on the mode of turning carriages on the rail-way, we find nothing in the specification. With respect to the last part of the improvement, eight pullies, with eight endless ropes, or chains, will, we apprehend, create more friction than they will remove, unless they be formed of materials which furnish ropes without rigidity, and links that have no rubbing parts.

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19. For an improvement in the art of *Charring Wood,* for the manufacture of charcoal; Isaac Doolittle, Bennington, Vermont, December 14.

Permanent kilns are to be built of masonry, of such capacity as may be desired. The walls may be run up to the height of 8 or 10 feet, and surrounded at top by a strong band of iron; an arched roof, or dome, is then to be constructed. Vent holes are left at the bottom, and about the middle of the walls, and also in the centre, and other parts of the dome. Chimneys, or flues, are also built around the walls. Door ways are left to charge with wood, and to remove the coal. These may be closed with iron, or with masonry. Stoppers are adapted to the various vents, so that they may be partially, or perfectly, closed.

The claim is to "the construction of permanent kilns above ground, with arched roofs, chimneys, and vent holes."

It is stated that "by the addition of a simple apparatus, this method of charring wood may afford vast quantities of pyroligneous

acid, which may be applied to various uses in the arts." In situations to which wood can be transported with facility, there can be no doubt of the economy of the plan proposed; and that the quality of the coal will be much better than that burned in the usual way, we have no doubt.

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20. For machinery for *Thrashing Grain;* William Barnes, Brookhaven, Suffolk county, New York, December 14.

The resemblance between this and the greater number of thrashing machines is such as to render it difficult to give its distinctive character. A cylinder, with eight, or any other number of iron beaters running along its surface, is made to revolve; the beaters are made of sheet metal, and stand edgewise. The cylinder runs in a hollow segment of a circle, formed of bars of iron, or other suitable material. A feeding apron, and rollers, carry the grain forward between the cylinder and concave segment; the latter is borne up by springs. The claim is to the springs, and the plates of iron on the cylinder.

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21. For an improvement in the machine for *Hulling Cotton Seed,* patented January 21, 1829; Francis Follet, Petersburg, Virginia, December 15.

Mr. Follet has devised an improved mode of feeding the seed to the hulling roller; of adjusting the concave segment; of using a double bottom sieve, and of cleaning the seed as it is hulled, by the addition of a fanner to the hulling machine; it is for these that the present patent is taken.

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22. For a machine for *Washing and Boiling all kinds of Wearing Apparel,* bed clothes, or fabrics, viz. woollens, cotton, hemp, and linen of every kind; J. T. W. Dennis, Paintville, Wayne county, Ohio, December 16.

A box, or trough, is formed with the bottom concave, and fluted across. A swing frame is sustained by two uprights, and has a fluted roller at its lower end, the flutes corresponding with those within the trough. The swing frame has its gudgeons within boxes operated upon by spiral springs, to regulate the pressure of the roller. The bottom of the trough is double, there being a space of an inch, more or less, between them. A steam pipe, from a boiler, passes through a hole in the side of the trough, leading into the above named space; the upper, or fluted bottom, is perforated with holes to allow the steam to ascend into the trough. The claim is to "the peculiar mode of constructing this machine as here described, and the mode of using steam between the two bottoms."

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23. For a machine for *Setting up Hat Bodies;* Orlando Root, Amsterdam, Montgomery county, New York, December 19.

Machines for setting up hat bodies have become very numerous; they, however, in general, agree in one point, that is, the receiving

the wool from a carding machine, upon conical rollers, on which it is slightly compressed, in order to prepare it for felting. That before us is not an exception to these remarks, its peculiar arrangements cannot be given by verbal description alone; the initiated, however, may, perhaps, form some idea of it from the claim, which is as follows.

"What I claim is the circular motion given to the hat body cylinder, by which the web of wool is wound so as to cover the entire surface of the same; the revolutions of the said cylinder on two conical rollers, with the assistance of four guide pulleys or trundles; the movement given to the carding machine to vibrate the web so as to form the hat bodies; producing the circular motions; the application of the two rail-ways, the carriage, the segments, arms, cams, and irons that support the rail-way; the conical rollers, the counter revolving shaft, and the sliding shaft, with their cog wheels upon them; the dog and spring, the perpendicular lever, with its fork and weight upon it; the block of wood on which the lever is suspended, the axletrees and trundles, the position of the same as described in the arrangement; producing the rotary motion of the cylinder; the application of the conical drums to regulate the motion of the cylinder; the manner of extending the power from the driving shaft, to the centre, of which the rail-ways are the segments, and from the centre of the vertical shaft, which is suspended under the centre of the carriage; and also from the top of this vertical shaft to the inclined shaft, and from the inclined shaft to the small end of one of the conical rollers; with the positions of these two conical rollers, and the guide pulleys, or trundles; also the application of the rail-ways, shaft, chains and gears, herein described, to vibrate the carding machine, together with their parts, bearing, positions, and principles appertaining to the same."

We would not invite patentees to adopt, as a model, the foregoing mode of stating their claims; the enumeration made, descends too much into such minutia as must render it very difficult, if not impossible, to sustain the claim. There must, in every patentable machine, be some distinctive characteristic which separates it from all others, and without which it cannot exist; it is this characteristic upon which every legitimate claim must be founded. Such terms as "parts, bearing, positions, and principles appertaining to the same," should they not be considered, in a court of law, as mere surplusage, would, we think, vitiate any patent.

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24. For *Weaving Narrow Stuff, such as Ribands,* webbings, tapes, ferrits, girthings, chain lace, fringes, &c. without the use of shuttles; John Thorp, Providence, Rhode Island, December 22.

The spools, or bobbins, upon which the filling is wound, are placed in some fixed situation above the loom; there are two of these bobbins, one supplying the filling on the right, and the other on the left side of the warp. Each thread descends through a loop in a flexible

wire spring, which serves to preserve its tension; two arms, or levers, one on each side, carry the thread into the web. When the thread is carried in, it is caught upon a pin on the opposite side, the arm then returns, leaving the thread looped upon the pin, and consequently doubled; the web is then trod, or sprung, and the filling beat up to its place. The web is next supplied with woof from the opposite side, and from the other spool, in the same manner as it was from the former, which binds the web together and forms a selvage on both sides of it.

The arms, or levers, are worked by racks and pinions, placed below the breast beam, the racks being acted upon by a crank motion. The arms which supply the filling, are, in general, made to answer the purpose of the reed and lay, in beating up.

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25. For a *Labour Saving Churn;* Samuel J. O'Brien, New York, December 22.

The inventor tells us that "this new and valuable invention consists in the application of a self-moving power, to the common dairy churn, thereby dispensing with the labour required in churning butter by the common mode."

A weight suspended by a pulley and cord is to be wound up like that of clock, or a roasting jack. The drum, or barrel, upon which the cord is wound, has a cog wheel on one end, which gears into a pinion, upon the shaft of which there is a fly wheel; a crank from this shaft works a pitman connected with the shaft of the dasher of the churn. To preserve the vertical motion of the dasher, there is a slide of iron, to serve as a guide, and fixed "in the same manner as the piston of a steam engine." There is no claim.

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26. For an improvement in *Wernwag's Patented Bridges;* Lewis Wernwag, Jefferson county, Virginia, December 22.

The improvements for which the present patent is taken, are, "the mode by which the floor, sides, and top of the bridge are braced and held together by diagonal, horizontal iron braces, to prevent its being crooked, also for straightening it when it becomes deranged. The manner of placing the timbers, forming the arches, loosely, between two, three, or more king posts, so that any of the timbers may be taken out, and others put in, without disturbing, or injuring, the other parts of the bridge."

"The mode of supporting bridges on piles, by metallic or stone segments, to prevent their rotting between wind and water, which may be roofed." The above improvements are also claimed as applied to revolving bridges over canals, &c.

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27. For a *Tide Power;* Henry M. Western, New York, December 23.

(See specification.)

28. For an improvement in the *Grist Mill;* Mark L. Chase, Frankfort, Waldo county, Maine, December 23.

Instead of stones, cast iron grinders are to be used; these are to be cast with the teeth, or dressing on them, both grinders being alike in this particular. The teeth of the grinders are inclined, like those of a saw. They form curves from the centre to within 3 or 4 inches of the periphery, where their form is altered from curved to straight, and their direction changed, so as to retain the substance to be ground until perfectly pulverized; the curves are in the direction of the revolution. The lower grinder is to revolve, the upper to be stationary.

We are told that "the advantages of this improvement, are, a saving of two-thirds of the expence of construction, and of the moving power; and by causing the lower grinder to revolve instead of the upper one, fine meal may be made with less friction than is encountered in the common mill."

There is no particular claim, and it would seem by the above, that the patentee supposes the running of the lower stone, or grinder, to be a novelty; those, however, who have attentively read this Journal, know that it has been repeatedly done.

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29. For an improvement on the machine invented by Francis Follet, for *Hulling Cotton Seed;* Jabez Smith, Petersburg, Virginia, December 28.

We have spoken of Mr. Follet's improvement in the feed part of his machine. Mr. Smith, who is associated with Mr. Follet in the proprietorship of this apparatus, has also devised a mode of regulating the feed from the hopper to the cylinder, to secure which is the object of the present patent; should we hereafter determine to describe the whole machine, these various improvements shall be properly represented.

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30. For a machine for *Paring Apples;* Reuben Mosher and Amos Mosher, Galway, Saratoga county, New York, December 28.

At least two patents have been previously obtained for the same purpose as that above named. The first was issued to Moses Coates, of Pennsylvania, in February, 1803. In that machine the apple was placed upon a forked spindle, which was turned by a crank, and a knife, with a guard, something like a spoke-shave, was passed over it, its pressure being regulated by a spring.

The machine of the Messrs. Mosher bears a great resemblance to Coates'; the spindle and fork are the same, but a multiplying wheel and band are used, to accelerate the motion. The knife is the same in principle as in the original machine. A minute description of lengths, widths, and thicknesses, is given, extending over seven pages, but no claim is made to any part.

We have not thought it necessary to examine the other patent

granted to S. Curttenden, of Connecticut, which, by the list, we find bears date, August 25, 1809.

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31. For an improvement in the *Mode of Burning Bricks;* Nathaniel Adams of Cornwall, and Aaron Noyes of Newburg, Orange county, New York, December 28.

We are directed in the specification to "take about one ounce of finely pulverized coal, and mix it with clay sufficient for making a brick weighing about 4 pounds when burnt."

"The bricks are also moulded in fine coal; they are then sun dried, and set in the kiln in the usual way."

"In burning the kiln, care must be taken that the arches are evenly heated, and fire made sufficiently strong to harden the bricks while the coal is burning out of them."

"*Invention claimed.*—We claim the mode of mixing and moulding in coal here described; also the method of burning."

By the mode of mixing, we must understand simply the mixing, as no particular manner of doing this is pointed out; nor do we see any thing described in the *mode* of burning, but that the heat should be even; and this certainly is not a new discovery.

By turning to page 420, vol. 3, new series, it will be seen that a patent was obtained by James Wood, of New York, for mixing finely pulverized coal, with clay, for making bricks, tile, or other clay ware. We apprehend that the two patents are, essentially, for the same thing.

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32. For an improvement in the *Application of Hot Water, or Steam, in the making of Casks, Barrels, Hogsheads, or Kegs;* Jonah Thompson, Philadelphia, Pennsylvania, December 30.

The claim of the patentee will fully exhibit the nature of his improvement, it is in the following words.

"All that I claim as my improvement, and for which a patent is asked, is the application of steam, or boiling water, to the staves of casks, barrels, hogsheads, or kegs, so that they may be set up and formed. The use of steam in seasoning wood, and rendering it flexible, having been long known, but never having been before applied to the manufacture of kegs, barrels, casks, or hogsheads."

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33. For an improvement in the *Spinning and Roping of Wool and Cotton,* by means of a machine called the "Golden Spinner;" Joseph B. Wheeler, Galway, Saratoga county, New York, December 30.

This is another modification, or alteration of form, of the Domestic spinner. It is intended to carry from 6 to 18 spindles; 12, it is said, may be worked by hand. A machine somewhat similar was patented by Mr. Wheeler, under the name of the "Complete Spinner," upon which this purports to be an improvement. The spindles

stand horizontally on the upper part of a frame about 5 feet in height. A crank is to be turned by hand, which gives motion to the necessary wheels and whirls, by means of bands. The claim is to the mode, described in the specification, of hanging and adjusting the spindles; and to the manner of gearing, and giving motion to the whole.

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34. For an improved *Thrashing Machine;* John Haws, Hudson, Columbia county, New York, December 31.

Cylinders, beaters, grooved or toothed pieces borne up to the cylinders by springs, feeding rollers, and feeding aprons, form the essential parts of this machine. To us it appears to differ in form only, from several others. The part which, in many thrashing machines, is called a hollow segment, and between which and a revolving cylinder the grain is thrashed, is here made narrower than usual, and is called a grate piece. The claim is to "*the grate piece on springs*, and the cylinders and grate piece *covered with cast iron* plates, *cast with* teeth." In a second cylinder, constructed somewhat differently, "*the grate piece on springs;* the moveable frame on *hinges;* and the *beaters running diagonally across the cylinder,*" are claimed.

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35. For a *Power Machine, to Drive, or assist in driving, other machinery;* William Hosford, Washington Township, Marion county, Ohio, December 31.

It would be a mere waste of time and paper to offer any description of the machine for which the patent under the above title was obtained. The specification and drawing, however, harmonize with the invention, the three affording but sorry specimens of the progress of science, literature, and the arts.

There is to be some sort of a vibrating, jointed frame, to which is to be attached a pitman, working, or worked, by a crank and a fly wheel; within the frame are to be placed two rollers, which, as they roll backwards and forwards, are to strike against springs, and to become so invigorated by their action, as to drive the machine to which they are attached, and any others which may be placed within their sphere.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

On the mode of laying the Rails, and the adaptation of the Carriages on the Baltimore and Ohio Rail-road. By THOMAS EARLE, *Philadelphia.*

THE usual mode of keeping the carriages upon rail-roads, is by means of ledges, or flanches, projecting from the *inner* edges of the rims of the wheels, which flanches must, of course, run against, or within, the inner sides of the rails. Consequently, where the rails are composed of wood and iron combined, the iron is nailed upon

the wooden rail next its inner edge, so that the edge of the iron protects the wood from the action of the flanches.

Upon the Baltimore and Ohio rail-road, a different construction is adopted. The iron is nailed upon the wooden rails next their *outer* sides, or edges, and, consequently, the only wagons which can be used, are those which have flanches projecting from the *outer* edges of the rims of the wheels, and running without the outer sides of the rails.

There are three disadvantages which appear to me to attend this method.

1. The load, in wagons of the usual form, always tends to strain the axles and bend their outer ends *upwards*, the wheel having, to a certain degree, the power of a lever. If the flanch be *without* the rail, whenever it presses against its side, a more powerful leverage is obtained, pressing the bottom of the wheel outward, and, of course, the end of the axle upward, or in the same direction as does the weight of the load. Thus a double force combines to strain the axle. But if the flanch is on the inner edge of the wheel, and runs within the rail, whenever it presses against the side of the rail, it tends to press the bottom of the wheel inwards, and, consequently, the end of the axle downwards, acting against, and neutralizing, the contrary pressure from the load. Hence the axles may safely be made smaller in the latter case, and have less weight and friction than in the former.

This objection, however, will not apply, if Mr. Winans' carriage alone be used, as in them the bearings upon the axles are outside of the wheels.

2. The tendency of the wheels to run off of the rails, which operates to prevent their being made of as large circumference as would be desirable, is greatly increased by the Baltimore method. For whenever there is a curve in the road, the weight of the load, from its previous impetus will be thrown upon the outer wheels, while the inner wheels, or those upon the inside rail of the curve, will tend to rise off of the rail. When the flanches are on the inside of the wheels, it will be the flanches of the outer wheels that will protect the carriage from running off, being the same wheels which are pressed firmly down by the load: but with the Baltimore carriages, the flanches of the *inner* wheels on the curve, will be the only guard against the wagon keeping straight forward, and running off the rails. The tendency of these inner wheels to be lifted up, so that they can pass over the rail, will greatly increase the danger.

3. If by any obstruction, or accident, the carriage should be thrown sideways, and the flanch of one wheel thereby lifted upon the rail, the larger circumference of the flanch would make that wheel travel faster than its opposite. This, if the flanch were on the outside of the wheel, would increase the wrong direction already given, and inevitably carry the wheels off the rails. But if the flanches were on the inner sides, the faster travelling of the raised wheel would restore the proper direction, and carry the wheel back to its

place. Hence we may see why few, or no instances, of the wagons, upon the common construction, running off the road take place.

Any person may try two model wagons, and he will find that one having the flanches on the outer sides of the wheels, will run off the road, if the wheels of either side be raised upon the rail; but if the flanches are on the inner side, though those of one side be raised upon the rail, they will return to their proper place.

For these reasons I would respectfully suggest to the directors of the important public work referred to, the propriety of re-considering their plan, and altering it if they shall see occasion.

Query on the Thermometer.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

I SHOULD be obliged, if some of your readers would make known, through this medium, the method by which we can ascertain the true increase or diminution of caloric, in a given quantity of matter, by the thermometer.

If, for example, a quart of water exhibit 40° Fahrenheit—apply heat until the temperature be 80°. It is then usual to consider that the water contains a double portion of caloric. But if we take Reaumur's scale, the quantity of water, at 40° Fahrenheit, would be 3° 55 Reaumur, to which apply heat, until it be raised to double 3° 55, or 7° 10, and the water would be only equal to 48° Fahrenheit.

Suppose Fahrenheit, instead of fixing his zero at the temperature produced by ice and salt, had placed it at the freezing point of nitric acid, say 52° below his present zero, which degree of cold was experienced by Parry, at Melville Island. Then the water, by the existing scale at 40°, would have been 40 + 52 = 92°, and when at 80°, would have been at 80 + 52 = 132°, showing a deficiency of 52° towards a double quantum of caloric.

It appears to me, that unless a thermometer scale be graduated from a natural zero (a state containing no caloric) it must even fail to indicate, not only the *absolute*, but the true *relative* degree of heat; supposing it to be sensible to the thermometer pro rata with its intensity. T. W. B.

Cincinnati, February 4, 1830.

Method of Preserving Butter.

TRANSLATED BY A CORRESPONDENT, FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

COMMON salt is the only substance hitherto employed for the preservation of butter. I have made many experiments on this subject, and the following method appears to me preferable to the old one, as it preserves to the butter a more agreeable flavour, and a better colour, and renders it less liable to become rancid.

Take one part of loaf sugar, one part of saltpetre, and two parts of pure salt; mix and reduce them to a very fine powder. As soon

as butter is perfectly worked (to extract the buttermilk) work into it one ounce of the above mixture to each pound, and pack it immediately, and as closely as possible, into pots, and smooth the tops over carefully; then cover the pots over with a fine linen cloth, and tie a piece of wet parchment (or bladder) over the whole. After a few days it will be found that the butter has settled, and no longer fills the pots completely, they must then be filled up, taking care that no space be left; then pour over the top a small quantity of butter melted at a low temperature, sprinkle over the surface a small quantity of the above mixture, and stop the pots as tight as possible, to exclude the atmospheric air. They should not be again opened until the butter is wanted for use. In this manner butter may be preserved several years; I have had it at the end of two years as fine flavoured as in the first month.

It should be remarked, that butter prepared in this manner, is not fit for use in less than a fortnight after being packed. By that time it will have acquired a very agreeable flavour, and so fresh, that persons who are in the habit of eating salted butter,* can hardly believe that this has ever been salted at all.

On opening the pots, care should be taken to use the top first, and not to cut down by the side. And if all the butter contained in one pot is not to be used immediately, what remains should be covered with the same care as at first; or it may be kept covered with brine.

Butter may also be preserved by working into it a small portion of pure honey, which imparts to it a very agreeable flavour, and renders it very valuable for aged persons, and those who have weak stomachs. I have seen butter preserved in this manner, which had been kept for several years, and which showed no tendency to become rancid. One ounce of honey to the pound.

[*Journal des Connaissances Usuelles et Pratiques.*

FRANKLIN INSTITUTE.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall, on Thursday evening, January 27, 1830.

Mr. Samuel V. Merrick, was appointed chairman, and

William Hamilton, Recording Secretary, *pro tem.*

The minutes of the last meeting were read and approved.

The following donations were presented, viz.

Strickland's Reports on Canals, Rail-ways, Roads, &c. presented by Major N. Ware.

Jones' Views of the Metropolitan Improvements, or London in the 19th Century, from original drawings, No. 1 to 37, inclusive, presented by Mr. David M. Hogan.

* In France, and especially in Paris, butter sold in the markets, is, for the most part, entirely destitute of salt; and is so served at table, where each one salts to suit his own taste.—Translator.

The Canal Engineer's and Contractor's Assistant, by Charles Potts, presented by the Author.

Œuvres de Roi de Prusse, 10 *vols. presented by John Bouvier, Esq.*

The corresponding secretary laid on the table the following works received in exchange for the Journal of the Institute.

London Journal of Arts and Sciences, for December, 1829.

London Journal of Arts and Register of Patent Inventions, for October, November, and December.

Gill's Technological and Microscopic Repository, for December.

Journal Universel des Sciences Médicales, for September.

Bibliothéque Physico-economique, for October.

Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for September.

Annales de Chimie et de Physique, for August and September.

Annales des Mines, vol. 5, Nos. 2 and 3, for 1829.

The committee on subjects for discussion, submitted the following question, "What is the difference between the absolute efforts employed to move a locomotive engine, when the force proceeds in one case from the engine itself, and in the other from a stationary engine, supposing the plane over which the motion takes place, to be horizontal?" which was accepted, and selected as the subject for discussion at the next meeting.

Professor Johnson presented for examination several very fine specimens of porcelain, manufactured in this city, by Messrs. Smith, Fife & Co.

Extract from minutes.

SAMUEL V. MERRICK, *Chairman.*
WILLIAM HAMILTON, *Recording Secretary, pro tem.*

Board of Managers.

A meeting of the Board of Managers was held at the Hall of the Institute, January 25, 1830.

JAMES RONALDSON, President, in the chair.

The Actuary read so much of the minutes of the annual meeting of the Institute as related to the election of this Board, whereupon the Board went into an election for the officers of the Board for the ensuing year; Messrs. Samuel J. Robbins and Isaac B. Garrigues were appointed tellers, who reported the following gentlemen duly elected, viz.

SAMUEL V. MERRICK, *Chairman.*
MORDECAI D. LEWIS, } *Curators.*
CHRISTIAN GOBRECHT, }

The president having left the chair, it was taken by the chairman, when, on motion, the by-laws, adopted by the former Board, were read, and after some amendment, adopted by this Board.

The candidates proposed at the last meeting of the former Board, were duly elected members of the Institute.

Several candidates for membership were proposed, and laid over till the next meeting, in conformity to the regulations.

A stated meeting of the Board of Managers was held at the Hall of the Institute, February 11, 1830.

Samuel V. Merrick, *Chairman.*

The minutes of the last meetings were read and approved.

The chairman nominated the standing committees, in conformity to the regulations, which, after adding Messrs. James J. Rush and W. R. Johnson to the committee on inventions, and Mr. S. V. Merrick to the committee on publications, and the managers of the sinking fund, was approved by the Board as follows.

On Premiums and Exhibitions.

James Ronaldson,
Samuel J. Robbins,
Matthias W. Baldwin,
Benjamin Reeves,
Isaiah Lukens,
Frederick Fraley,
Thomas U. Walter,
James M. Bolton.

On Inventions.

James Ronaldson,
Matthias W. Baldwin,
Christian Gobrecht,
Isaiah Lukens,
Andrew Young,
Benjamin Reeves,
Rufus Tyler,
James J. Rush,
Walter R. Johnson.

On Publications.

Samuel V. Merrick,
Isaac Hays, M. D.
Rufus Tyler,
Isaiah Lukens,
Matthias W. Baldwin.

On Instruction.

George Fox,
Isaac B. Garrigues,
Henry Horn,
Adam Ramage,
Charles H. White.

On the Cabinet of Models.

John Struthers,
John O'Neill,
Joseph H. Schreiner,
Thomas Scattergood,
Thomas Loud.

On the Cabinet of Minerals.

Thomas M'Euen, M. D.
Isaiah Lukens,
Abraham Miller,
Thomas Fletcher,
James Rowland, jr.

On the Library.

Isaac Hays, M. D.
Samuel J. Robbins,
Mordecai D. Lewis,
Thomas U. Walter,
Charles H. Kerk.

Managers of the Sinking Fund.

Samuel J. Robbins,
Frederick Fraley,
Matthias W. Baldwin,
Samuel V. Merrick.

Auditors.

Abraham Miller,
Isaac B. Garrigues.

On motion, it was resolved, that the same gentlemen who were appointed by the former board on the special committees, for trying the experiments on water wheels, and for reporting the form and design of a diploma of membership, be again charged with those duties.

Extracts from the minutes.

S. V. MERRICK, *Chairman.*

WILLIAM HAMILTON, *Actuary.*

ENGLISH PATENTS.

To JAMES FRASER, *Engineer, for a new and improved method of Distilling and Rectifying Spirits and Strong Waters.* Dated March 4, 1826.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said James Fraser, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, is particularly described in manner following, (that is to say:)—That my invention consists in an arrangement of parts, by which the process of distillation is completed, by the vapour or steam of the first or primary still being made to pass through the interior of the spirit or secondary still, by means of tubes or hollows of any shape or form, or such as are commonly used for heating by steam, or for the purposes of condensation, but an extensive surface ought to be kept in view; or by the said steam of the primary still being made to act on the external surface of the said spirit or secondary still; or by the said steam or vapour of the said primary still being made to act on the external part, and on the internal part also of the said spirit or secondary still at the same instant of time; thus placing the contents of the secondary or spirit still between the entire power of the steam or vapour from the primary still in its passage or passages, into the primary worm or condenser, and such secondary still can be placed on the top of the primary worm or condenser, or in such situation as convenience may point out, so that the steam of the primary still is made to act with effect as above. The above is the patent for which I declare, connected with the above system, for which I claim exclusive right, and which will materially lessen the empyreuma always attached to new made spirits.

I proceed to describe a simple and efficient process, partly original, and partly the effect of the practice of others, for which I do not claim exclusive right, but which is necessary to be known to form a more complete and perfect whole. In the first place, surround the primary still with water; when this boils it will also boil the contents of the primary still, and also prevent the sediment of the wash or low wine from adhering to the bottom: this has been my practice for a considerable time. It is here evident that the water round the primary still can be heated much above what is required to boil the primary still, and that the steam of this water can also

be made to heat the wash prior to its entrance into the interior of the primary still, or to boil any other fluids at a distance from the fire, or steam casks, &c. &c. The water boiler and the primary still being now charged, and both in a state of ebullition, the vapour proceeds through the head and connecting tube, into the secondary still, from thence to the worm or condenser; and as it is of great importance to prevent the wash or low wine from boiling over into the worm or condenser, a check is placed in the secondary still to prevent it: by a check is meant any opposition at a higher level, so that if room is left between the contents of the still and the said check, whatever boils up will not be able to get over, but remain between both until the fire is damped, and the whole returned to the still as at first; this check is perhaps three parts up, leaving one for the vapour to get over, which has also the property of separating the aqueous parts from the spirit, as the lighter body rises to the top and passes over the said check. The primary still being now run off, is again filled with heated wash; the contents of the first charge is supposed to be received below the primary worm or condenser into a properly secured recipient; from this recipient it is pumped up into the secondary still, the wash being highly heated before it passes into the primary still, speedily boils, and its vapour being in contact with the surface which contains the spirit thus pumped up, the finish or rectification in the secondary still will proceed rapidly, and pass into its own worm or condenser, and so on into its own recipient, as a finished article. It is not difficult to imagine two primary stills kept in action by one secondary still, nor a secondary still by the surrounding water of the primary still; nor a rectifying still being made of the primary still by this system; in fact, this system can assume any form, and will not only place our distilleries on the most economical and efficient footing, but save at least fifteen per cent., and yield a very superior article, whilst it secures the duty to the certainty of a fraction.

In witness whereof, &c.

OBS.—On a superficial perusal of this specification, it will appear to include in the patent right much more than is really intended; but a more careful examination will show that no claim is made in it to the modes of distillation, the description of which occupies the greatest part of its contents, and by far the most valuable. It is not easy to imagine what could induce the patentee to encumber this document, with so much matter irrelevant to its main object, (of describing the improvements to which his patent extends,) and it appears to us that his doing so is far from being judicious.

The causing the vapour from one still to act on the contents of a second still, for the evaporation of their spirituous portions, (which includes all that is really claimed by the patentee) has often before been practised in various ways, being in fact nothing more than distillation by a steam bath: and as to the internal application of this bath, by tubes passing through the second still, which may seem a new application of the principle, that also has been practised by

Mr. Smithson Tenant, previous to the year 1815; his method of doing which, and a description of his apparatus and of its advantages, may be seen in our 27th vol, second series, p. 214. Mr. Tenant employed, in addition, an artificial vacuum; but this does not alter the case, as the present patent process is evidently that of this experienced chemist, denuded of this circumstance.

Another mode of employing the vapour of one still to cause distillation from other stills, invented by Mr. Adam, is given in our 20th vol. second series, p. 180 and 238; and that of M. Berard, for the same purpose, in p. 370 of the same volume. [*Rep. Pat. In.*

To JAMES WRIGHT, *Soap Maker, for improvements in Condensing the Gas or Gases produced by the decomposition of Muriate of Soda, and certain other substances, which improvements may also be applied to other purposes.* Dated April 28, 1829.

THE specification of this patent has not been enrolled, but the following account of the invention has been communicated to us by the patentee.

A circular wall is built of a size deemed sufficiently large for the extent of the manufactory, and covered with a roof or dome, with one outlet in the centre; the bottom of the circular chamber thus formed is lined with lead or other substance impervious to water, and around it are placed as many decomposing furnaces and driers, as can conveniently be managed, with a flue proceeding from each, terminating in the inside of the chamber, so that the gases from each meet, as in a common receptacle. By means of a force pump, water impregnated with lime is constantly injected into the chamber, through a perforated hose; this attracts a great portion of the gas, and settling in the bottom of the chamber, forms a stratum of lime water, which quickly absorbs the portions of gas which follow, and also cools and moistens that portion of the gas which is not condensed, rendering it more fit for the second operation. This gas makes its escape from the chamber, by a horizontal flue from the centre, which may be continued to any length, terminating in a circular cast-iron pipe of the same size as the flue, which passes into a wooden cylinder lined with thin lead; a similar pipe connects the flue with another cylinder, or with the chimney, and may be placed at any distance from the former that may be deemed most expedient. These cylinders revolve upon the flue pipes as upon an axis, and have a number of shelves placed in the interior, parallel to their axes; between each shelf is an opening with a cover to fit, by which is introduced a quantity of slacked lime. The cylinders are made to revolve by the same power which works the force pump, which causes the shelves to disperse the lime in every part of the cylinders, thus keeping an atmosphere constantly loaded with lime in a state of most minute division, through which the atoms of gas must pass, and they are thereby so completely absorbed, that (vegetable blue)

test paper, placed over the top of the chimney, remains unchanged. The patentee approves of two cylinders being used on the same flue, as they render the success of the operation more certain, and allow an opportunity of changing the lime in one, while the other continues at work.

Mr. Wright likewise asserts, that his invention is applicable to the purification of coal gas, and to the manufacture of chlorate of lime. He states that the gases coming from the retorts being passed through the chamber and cylinders where lime is in so complete a state of division, and presenting a constant succession of surfaces, the whole of the sulphuretted hydrogen is absorbed, leaving the carburetted hydrogen in a state of great purity. In manufacturing the chlorate of lime, he decomposes the muriate of soda in one set of retorts, and drives off in another set, by means of heat alone, the oxygen from the black oxide of manganese; the pipes from each terminate in a horizontal main or general receiving pipe, on both sides of which are placed any number of revolving cylinders, charged with fine lime, which, by this method, becomes completely saturated. The residuum of his retorts, is, in one set, sulphate of soda, without any admixture of sulphate of manganese; and in the other, manganese, deprived of a part of its oxygen; which manganese, upon being exposed in thin strata to a circulation of atmospheric air, speedily recovers the oxygen it had lost, and becomes fit for future operations. A great saving, the patentee affirms, is thus effected, and the chlorate of lime produced will be of a much superior quality.

[*Ib.*

To William Farish, *Jacksonian Professor in the University of Cambridge, for an improved method or methods of Clearing out Water-courses.* Dated September 4, 1828.

Three methods are described in the specification of this patent, for effecting the purpose stated in the title. In the first, a vessel is used of an oblong form, rectangular for the greatest part of its length, but sloped in an angle of about 45 degrees from the bottom upwards in front: this vessel is suspended on two pivots, resting on adequate supports, at about a third of its length from the hinder end; which latter is made so as to be heavier than the front portion, and is sustained in a horizontal position by a prop underneath, or other sufficient means; and water being let to run into this vessel from a higher vessel, as soon as it becomes full, the larger contents of its front part will cause this to overbalance its hinder portion; when it will turn over, and discharge the whole into the water-course beneath, and will again fall back by the greater weight of its hinder part, into a horizontal position ready for another charge.

In the second method a vessel is used for the same purpose, and constructed on the same principle as the first, but of a different form. The outline of the longitudinal section of this vessel somewhat resembles a small portion of a volute, proceeding from a circle,

having the projection of the former turned upwards; the water runs in at the lip formed by this projection, and the vessel being suspended on pivots, similarly to the former, but placed at the centres of the cylinder, (of which the circle mentioned is the section) when it becomes full to near the edge of the lip, its front part will turn down, from the greater weight of water in the projection, and will discharge the whole of the contents into the water-course underneath: a counterweight at the side opposite to the lip will bring back this vessel to its first position when empty, as in the former instance; adequate stops being provided to prevent it, as well as the other vessels, from turning round too far in either direction.

In the third method a turning vessel is used, nearly of the same shape as the last, and supported in the same manner, but closed at the lip so as to leave but a small aperture; this vessel is enclosed by a water tight case, adjoining to the bottom of a reservoir, that is placed at a higher level than the water-course, and is supplied by a stream of water; from the top of this case a tube ascends vertically to within an inch or two of the highest level, to which the water in the reservoir is capable of rising; and a funnel is fixed in the top of the turning vessel directly beneath this tube; when the water ascends above the top of this latter, it will of course fill the vessel, and cause it to turn round with the projection downwards similarly to the others; in which position it will remain, until the whole of the water that it has received be discharged by the small aperture mentioned. The turning vessel in this case is only employed as a means of drawing a horizontal valve from over the orifice of a large tube, by which the whole of the water in the reservoir then runs down into the water-course; this is effected by a vertical toothed wheel on the pivot of the turning vessel, that operates on a horizontal toothed rack, a bar from which runs out to the valve, through a stuffing box in the enclosing case; and another tube of smaller dimensions, that proceeds downwards from the bottom of this case to the water-course, and carries off all the water that runs into it from the turning vessel, completes the apparatus. The use of the small dimensions of the aperture in the projecting part of the turning vessel, is to prolong the time of the discharge from the reservoir; since, when the vessel is entirely empty, its counterweight, in restoring it to its first position, will at the same time close the valve of the tube, through which the discharge is effected.

Obs.—Since it is evident, that an adequate effect from a discharge of water in clearing a water-course cannot be produced by a very small quantity, it appears to us that the two first methods for this purpose directed in this specification, cannot be of much utility; no vessels of any manageable size being capable of holding the water, that would be required to occasion any perceptible operation on the mud in the bottom of trenches or canals of this nature. The third method would not be liable to this objection; but as the quantity of the discharge of water, that it could effect, must depend on the time that the turning vessel required for evacuating its contents, unless

the size of this vessel were enormous, the discharge could not even in this case be very great.

We, however, think that it would not be difficult to keep the valve of this apparatus open, until the *whole* of the contents of the reservoir were discharged; by the addition of a small vessel to be filled by the discharge, the weight of which should raise a bolt, to keep the valve from closing as long as it remained full; but which being emptied on the discharge ceasing, by means of a small hole at its bottom, would no longer counterbalance the weight of the bolt; by the consequent descent of this, the valve being freed from impediment, would again close, and cause the reservoir to be filled for a new operation.

Still, however, even if this objection were removed by the means proposed, or some other equally efficacious, since a fall would be required at the end of the water-course, to let the water run from it, according to the method of the patentee, and another fall still greater into it at its head, for the operation of the apparatus, together with a stream of water descending into this latter fall, it appears to us that this stream, aided by the two falls, would keep the water-course clear, in any case, where water sufficient was supplied by it to work such an apparatus, without the assistance of the latter, or that of any other machinery.

It also appears to us, that as the chief deposits of mud, or other sediment, and those most necessary to be cleared away, are made in channels, or other places, to which the tide has access, (which renders it necessary that any discharge from reservoirs, for the purpose of clearing them, should be made at the time of low water,) the apparatus of the patentee not being applicable to such situations, (from its discharge depending on an upper fall of water, and, consequently, being in no wise affected by the tide,) would be of very little general utility. We can readily conceive how the retreat of the tide might be made to open reservoirs of the nature of those mentioned, but even this would not be sufficient, since there are places, where the reservoirs or basins must not be discharged every tide; as, for example, the artificial harbour of Dunkirk, where the discharge is only made about once a week; but then in such abundance, as to visibly agitate the sea two miles from the shore; this latter circumstance more particularly demands notice, from the great deficiency of most plans, hitherto used for similar purposes, arising from the basins, serving as reservoirs, being too small to afford any adequate discharge.

A very good method of managing the clearing of canals in similar situations, applicable also to harbours, and tide mill ponds, may be found near the end of Mr. Bramah's very singular specification of the patent granted to him for improvements in the conveyance of water, &c. which is inserted in our 23d vol. p. 257, second series.

[*Ib.*

To JOHN DICKINSON, *Paper Manufacturer, for a new improvement in the method of Manufacturing Paper by Machinery, and also a new method of cutting paper and other material into single sheets or pieces, by means of machinery.* Dated January 14, 1829.

THE patentee commences by stating, that after the first consolidation of the pulp into paper, by means of the greater part of the water being drained off, by passing over a continuous web of woven wire, it is, in the usual course of manufacture, passed by an endless felt through a series of press rollers, successively, in the same way, by which it is experienced that the upper side being alone submitted to the action of the polished surface of the press roll, retains a greater degree of gloss than the under one which remains on the felt; one of his improvements consists in alternately reversing the sides of the paper as it passes through the rollers, in order to give it a uniform appearance; this he accomplishes by a combination of rollers and endless felt working in contrary directions. The second improvement consists in causing cotton, flaxen, or silken thread, web, or lace, to be introduced into the paper, in such way that they shall form the inner part: the advantage derived from such an operation he does not, however, state. The threads or other material being wound on bobbins, so arranged as to revolve and unwind the threads with facility, are placed over a roller having small semi-circular grooves in it, which conveys them to the roller of woven wire immersed in the pulp; they intermix with this substance, and the paper thus formed is conveyed by an endless felt to the pressing rollers, where, as well as in subsequent stages, it undergoes the same operation as on ordinary occasions. The threads may be placed at the distance of an eighth of an inch apart, or as may be thought proper. If lace or web be employed, a single bobbin of suitable dimensions must be used, in the same manner as those for the threads. The third improvement, as expressed by the title, consists in the mode of cutting the paper into sheets. This is effected by means of a swinging frame, worked by an eccentric alternately backwards and forwards; on the lower end of the frame is fixed a spindle having four or more circular cutters, placed at a proper distance apart, which come in immediate contact with an equal number of straight cutters that are fixed on a cast-iron table under the frame, and exactly parallel with the reel, from whence the paper is drawn. Between each stroke of the frame the paper is placed across the straight cutters by an attendant, and the machinery is so arranged as to allow an interval for this operation. As this last improvement may, with advantage, be combined with the first one, the patentee observes that the same power which turns the pressing, and other rollers, may be employed to propel the cutting frame. [*Ib.*

To ROBERT STIRLING, *Clerk Minister of Galston, and* JAMES STIRLING, *Engineer of Glasgow, for their having invented, or found out certain improvements in Air Engines for moving machinery.* Enrolled August, 1827.

THIS is an engine constructed in the same way as an ordinary steam engine, with a piston working up and down in a cylinder, from the reciprocating action of which power is intended to be obtained for giving motion to other machinery. Instead, however, of employing steam acting against a vacuum, as the agent for moving the piston, it is proposed in the present instance to employ volumes of hot and cold air; the dissimilar elastic forces of which applied alternately on opposite sides of the piston, raise and depress it.

The volumes of air by which the engine is to be worked are contained in two vessels placed near the engine, from each of which vessels there is a pipe leading to the cylinder; the one delivering the air above the piston, the other below it. The piston therefore is worked by forcing into the cylinder one of the volumes of air, while the other is allowed to escape out of it; and the mechanical force of the air is increased by heating the injected volume, and cooling that volume which is withdrawn.

To effect these objects, two distinct hemispherical or dome shaped furnaces are constructed, above each of which there is a corresponding hemispherical or dome shaped chamber, with cylindrical sides, containing the volume of air intended to be employed as the motive agent, and in each of the said chambers there is a piston, also hemispherically formed, exactly fitting the sides of the chamber, and working up and down therein for the purpose of expelling the air from the chamber into the cylinder of the engine.

The pistons of the two air chambers are to be raised and depressed alternately by a vibrating beam connected to the ends of their rods, which beam is to be actuated by some of the moving parts of the engine when set to work. The fires which are intended to burn with a uniform heat in the furnaces under each chamber, are for the purpose of causing the volume of air beneath each of the pistons to be heated, and of course its elastic force to be increased: while the volume above the piston becomes cooled by a blast of cold air, or a stream of cold water passed over the top of the chamber.

Depressing the piston in either of the air chambers, causes part of the volume of heated air beneath it to be forced through its pipe into the cylinder of the engine, and then to drive the piston by its elastic force, which act causes at the same time the piston in the other air chamber to rise, and thereby to draw off through its pipe the volume of air from the opposite side of the working piston.

The peculiar feature of novelty in this apparatus appears to be the construction of the pistons in the air chambers, by means of which a rapid change of temperature is effected in the air from hot to cold, and *vice versa*.

The air pistons formed, as before said, into hemispherical shapes,

are to be several inches in thickness, and constituted of several plates of metal with multitudes of small perforations in them. The plates are to be kept a little distance apart, either by indenting them, or by introducing small pieces of hard substances between the plates, and the whole of them being secured together constitute a colander, through which the air percolates with difficulty.

In the descent of either of the pistons, that part of the heated air which is not forced into the cylinder of the engine, passes upwards through the small holes of the piston, and becomes cooled by being brought in contact with the surface of the cold part of the air chamber, and the piston in rising again allows the air thus rendered cold to pass from the upper part of the chamber through the perforations of the piston to assist in cooling that portion of the volume of air which is being withdrawn from the cylinder.

In this way it is proposed alternately to change the temperature of the air in the two chambers with great rapidity, and taking advantage of the superior mechanical force of the air when heated, to employ it when driving the working piston of the engine.

[*London Journal.*

To JAMES STOKES, *Merchant, for his invention of certain improvements, in making, boiling, clarifying or preparing raw, or Muscovado, Bastard Sugar, and Molasses.* Enrolled April, 1828.

THE object of this invention is to prepare sugar from the cane juice or molasses, of a superior quality to that obtained by the ordinary process.

The juice, say one hundred gallons, being placed in a suitable vessel for clarification, add to it fourteen pounds of charcoal in a pulverized state; seven pounds of the bark of the wild elm, and one pound of lime. Mix them well together, and when settled, skim off the foul matter from the surface. Then filter the liquor through a blanket, as usual, and afterwards boil and evaporate it to a state of crystallization.

When the sugar has become cold, mix with one hundred weight of it, one gallon of brandy, rum, gin, or other spirituous liquor, and then by hydraulic pressure, or any other means, express the molasses, which renders it fit to be put into moulds, or into casks for the market.

In adapting part of this improved process to the clarification of bastard or brown sugar, mix with the sugar spirituous liquor in the above proportions, and press out the molasses as above described.

The patentee does not point out what part of this process he considers to be new; and for our part, we are unable to discover the novelty, as several of the materials mentioned, and the mode of applying them, have, if we mistake not, been long in use for the same purpose. EDITOR. *Ib.*

To Baron Charles Weterstedt, *for his invention of a Liquid or Composition for water-proofing or strengthening Leather.* Enrolled December, 1828.

This composition for rendering leather water proof, is proposed to be made of the following materials:—

Of rosin take sixteen pounds, and of tallow five pounds, which are to be boiled together in one gallon of linseed oil until the rosin is perfectly dissolved, and mixed with the tallow and oil; to this, add one and a half pounds of spirits of turpentine, in which has been previously dissolved about an ounce and a half of caoutchouc, commonly called Indian rubber.

This composition is suited for rubbing into the soles of boots and shoes, and will render them perfectly water proof; but for the upper leathers of such articles, and for harness and other leather, the following composition is proposed:—

Take of neatsfoot oil one gallon, of tallow six pounds, of hogs' lard eleven pounds, and of bees' wax half a pound; which being boiled together until perfectly mixed, must be allowed to cool, and after its having become cold, add to the composition three pounds of spirits of turpentine, in which three ounces of caoutchouc (Indian rubber) has been dissolved.

The patentee has not stated what he claims as new in this composition. Our opinion is, that every one of the articles mentioned have been either applied to render leather water proof, or to form water proof substitutes for leather. Editor. *Ib.*

To John Braithwaite *and* John Ericsson, *Engineers, for their new invented mode or method of converting Liquids into Vapour or Steam.* Enrolled July, 1829.

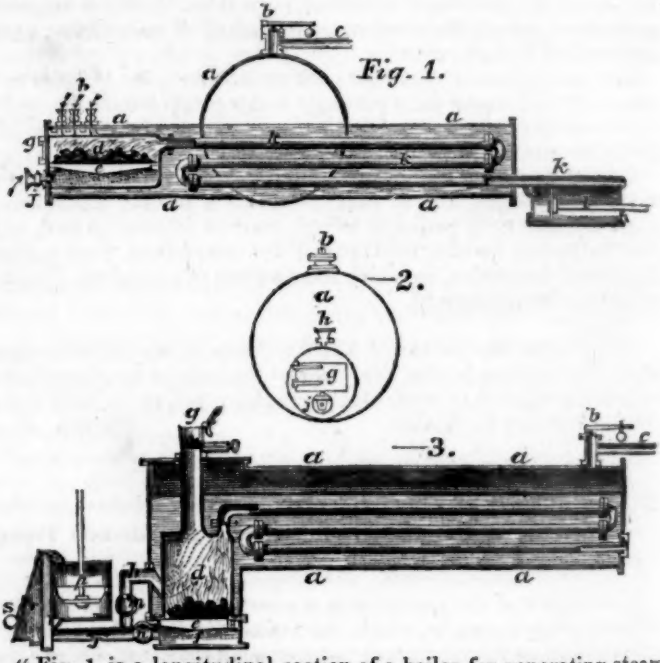
The subject of this invention is a peculiar construction of boiler for generating steam, in which the heated air from the furnace is either drawn or forced through pipes of small diameter, which pipes constitute the flues, and are surrounded by the water contained within the boiler. By this contrivance, a very extended heated surface is placed in contact with the water, and steam is thereby generated with greater effect than in any other boiler heretofore employed for that purpose.

The peculiar construction of boiler herein proposed, is applicable to the working of any kind of steam engine; but it appears to be particularly designed for locomotive steam carriages, in which situation it has been found extremely effective.

The patentees describe their invention in the following words:—

Specification.—"Our said invention consists in generating steam in a boiler, wherein the capacity of the flue is too small to allow a sufficient quantity of heated air to pass through it in a given time by

the mere agency of what is commonly called atmospheric draught, and to which flue, therefore, we attach either an air-forcing at the furnace end, or an air-exhausting apparatus at the other end of the flue, in order, by these mechanical means, to compel the required quantity of heated air to pass through the flue in a given time, whereby we are enabled to expose a given surface of flue to such a quantity of caloric in a given time, as will generate more steam than has ever before been produced in an apparatus of equal capacity, and thus effect a great saving in fuel, and greatly diminish the size and weight of a boiler.



"Fig. 1, is a longitudinal section of a boiler for generating steam, according to the method which we claim as our invention, and through the flue of which the heated air is drawn, by means of an air-exhausting apparatus, which apparatus, for the purposes of this invention, we call an air-sucking pump; *a*, *a*, *a*, is the outer casing of the boiler; *b*, is the safety valve; and *c*, the steam pipe; *d*, is the furnace; *e*, one of the furnace bars; *f*, the ash pit; *g*, the furnace door; *h*, three air cocks, to admit atmospheric air to the top of the fuel in the furnace; *j*, an air cock, to admit atmospheric air to the bottom of the said fuel; *k*, *k*, *k*, *k*, the flue gradually diminishing in diameter from the furnace, in proportion as the heated air, cooling in its passage through the flue, gradually requires less vent; while another advantage of this form, is, that the dust and dirt of the fur-

nace have a constantly descending passage to escape at; which, together with the relative position of the different lengths of the flue being immediately under each other, prevents any inconvenience from dirt collecting in it.—*l*, is a double action air-exhausting pump, which we call the air-sucking pump; and it is evident, that if this pump be worked, any given quantity of heated air may be drawn through the flue from the furnace, in any given time proportionate to the action of the pump, the number or size of the air cocks, and the general dimensions of the apparatus. Fig. 2, is an end elevation of the boiler just described.

"Fig. 3, is a longitudinal section of a boiler for generating steam, according to the method which we claim as our invention, and through the flue of which the heated air is forced by means of an air-forcing apparatus, which apparatus, for the purposes of this invention, we call an air-forcing pump; *a*, *a*, *a*, is the outer casing of the boiler; *b*, the safety valve; *c*, the steam pipe; *d*, the furnace; *e*, a fire bar; *f*, the ash pit; *g*, a hopper, for feeding the furnace with fuel; *h*, an air pipe, furnished with a regulating cock *m*; through which atmospheric air is forced on to the top of the fuel; and *j*, is another air pipe, also furnished with a regulating cock, *n*, through which atmospheric air is forced to the bottom of the fuel; *p*, is an air-forcing apparatus, which we call an air-forcing pump, furnished with valves, as here shown, and an air regulator, *r*, being a board, inclosed in a leather case, and acted upon by the weight *s*.

"It will be evident that this boiler, as far as the principle of our invention is concerned, will produce the same effect in generating steam, as that first described, the difference therein being merely in the mode of obtaining the required velocity for the heated air in its passage through the flue; but it is worthy of remark, that the modifications necessary to the adaptation of the principle of our said invention to these two forms of boilers, render them respectively the better available for different purposes.

"In Fig. 1, it will be observed that the furnace is horizontally placed, and may be fed from a door in the front, as at *g*, in the ordinary way, while at Fig. 3, the furnace is vertically placed, and must be fed from a hopper, as shown in the figure.

"Now, whereas we claim as our invention the converting of liquids into vapour or steam, by means of a boiler, wherein the capacity of the flue is too small to allow a sufficient quantity of heated air to pass through it in a given time, by the mere agency of what is commonly called atmospheric draught, and to which, therefore, either an air-exhausting apparatus, or the air-forcing apparatus hereinbefore described, is applied for that purpose, it being our intention to claim as new the application of an air-exhausting apparatus generally for such purpose; and the particular air-forcing apparatus hereinbefore described, whereby, as well as in the air-exhausting apparatus, the fuel is supplied with air both above and below, as shown in the drawing annexed, which double supply of air, regulated by cocks as aforesaid, we claim also as new." [*Ib.*

Account of the performance of various Rail-road Carriages on the Liverpool and Manchester Rail-road.

Grand Mechanical Competition—Rail-road Race for £500.—The great rail-road between Liverpool and Manchester being now nearly completed, the directors of the undertaking, some time ago, announced that they would give a premium of £500 for the locomotive engine, which should, at a public trial to be made on the 1st of the present month of October, (afterwards postponed to the 6th) draw on the rail-way a given weight with the greatest speed at the least expense. The offer of so handsome a premium, and the brilliant professional prospects which the winning of it presented to mechanical men, naturally excited a very lively spirit of competition among them. In almost every quarter of the country, engine makers and engine inventors set themselves to work to secure the prize; and the result, we are happy to say, has been such as to furnish a lasting example of the wisdom of calling into action, and giving fair play, to *the general talent of a country*, when any great public object has, as in the present instance, to be accomplished.

At all hands, the directors of the Liverpool and Manchester rail-way, deserve thanks for their conduct on this occasion; from their constituents, for the good sense and liberality which dictated a competition by which the capability of the rail-way, to do all that was promised, and much more, has been at once placed beyond all doubt, and the chances of a profitable return for the money invested in it increased at least tenfold; from the owners of the competing engines, for the liberal encouragement by which they were induced to *start for the plate*, and the impartial spirit, (divested of all local and personal influences) in which the competition has been conducted; and from the nation at large, for the powerful impulse which this demonstration of the extraordinary celerity with which carriages may be propelled on rail-ways, must give to the more extensive adoption of this mode of conveyance throughout the kingdom.

The principal conditions on which the prize was offered, were these:—1st. That each engine entered for the competition should weigh not more than six tons, and be capable of drawing after it, day by day, on a level plain, a train of carriages of a gross weight, equal to three times the weight of the engine itself, at a rate of not less than ten miles per hour, with a pressure of steam in the boiler not exceeding 50lb. on the square inch. 2. That the engine and boiler should be supported on springs, and rest on six wheels, and the height from the ground to the top of the chimney should not exceed fifteen feet. 3. That the engine should "effectually consume its own smoke;" and 4. That there should be two safety valves, one of which should be completely out of the reach of the engine man's interference.

The gentlemen appointed by the directors to act as judges on the occasion, were J. U. Rastrick, Esq. of Stourbridge, civil engineer, Nicholas Wood, Esq. of Killingworth, civil engineer, (author of the excellent work on rail-ways) and John Kennedy, Esq. of Manchester.

The portion of the rail-way chosen for the "running ground," was on the Manchester side of Rainhill Bridge, (about nine miles from Liverpool) where the rail-way runs for two or three miles on a dead level.

Early on Tuesday, the day of competition, great crowds of people were assembled from all parts, to witness the sight. There were many individuals who had come hundreds of miles for no other purpose; and, as may readily be supposed, these were not idle spectacle hunters, but chiefly engineers and men of science capable of appreciating, in its full extent, the great importance of the exhibition.

The number of competitors was at first reported to be ten, and we have reason to know there was at least as many engines as this in preparation. In this new sort of race, however, as in others, there were some withdrawn, and some prevented by accidents from making their appearance; and the number was reduced, on the morning of trial, to five, which were thus described in the official list of *the running coaches:*—

No. 1. Messrs. Braithwaite and Ericsson, of London; "The Novelty;" copper and blue; weight, 2 tons, 15 cwt.

2. Mr. Ackworth, of Darlington; "The Sans Pareil;" green, yellow, and black; weight, 4 tons, 8 cwt. 2 qrs.

3. Mr. Robert Stephenson, Newcastle-upon-Tyne; "The Rocket;" yellow and black; white chimney; weight, 4 tons, 3 cwt.

4. Mr. Brandreth, of Liverpool; "The Cycloped;" weight, 3 tons; worked by a horse.

5. Mr. Burstall, Edinburgh; "The Perseverance;" red wheels; weight, 2 tons, 17 cwt.

The engine which made the first trial, was the "Rocket" of Mr. Robert Stephenson (the son, we believe, of Mr. George Stephenson, the engineer of the rail-way.) It is a large and strongly built engine, and went with a velocity, which, as long as the spectators had nothing to contrast it with, they thought surprising enough. It drew a weight of twelve tons, nine cwt. at the rate of ten miles four chains in an hour, (just exceeding the stipulated minimum,) and, when the weight was detached from it, went at a speed of about eighteen miles an hour. The faults most perceptible in this engine, were a great inequality in its velocity, and a very partial fulfilment of the condition, that it should "effectually consume its own smoke."

The next engine that exhibited its powers was "The Novelty" of Messrs. Braithwaite and Ericsson. The great lightness of this engine, (it is about one-half lighter than Mr. Stephenson's) its compactness, and its beautiful workmanship, excited universal admiration; a sentiment speedily changed into perfect wonder, by its truly marvellous performances. It was resolved to try first its speed merely; that is, at what rate it would go, carrying only its complement of coke and water, with Messrs. Braithwaite and Ericsson to manage it. Almost at once, it darted off at the amazing velocity of twenty-eight miles an hour, and it actually did one mile in the incredibly short space of one minute and 53 seconds! Neither did we observe any appreciable falling off in the rate of speed; it was

uniform, steady, and continuous. Had the rail-way been completed, the engine would, at this rate, have gone nearly the whole way from Liverpool to Manchester within the hour; and Mr. Braithwaite has, indeed, publicly offered to stake a thousand pounds, that as soon as the road is opened, he will perform the entire distance in that time.

It was now proposed to make a trial of the "Novelty," with three times its weight attached to it; but through some inattention as to the supply of water and coke, a great delay took place in preparing it for its second trip; and by the time all was ready, the day was drawing so near to a close, that the directors thought it proper to defer the prosecution of the competition till the following day.

[*Mechanics' Magazine, October* 10.

In our last number we gave an account of the commencement of this interesting and important competition. We now propose to resume the subject *de novo*, and to go into it with all the fulness and circumstantiality which it so pre-eminently deserves.

It may be necessary for the information of some of our readers, to premise, that though rail-ways have been for more than a century in use in Great Britain, and are now extremely numerous, the one which has been the scene of the present competition, is but the third which has been constructed in Great Britain for general use; that is to say, with the view of superseding, entirely, the employment of ordinary roads, by the public at large, as far as carriages of all descriptions are concerned; and that down to the day of this competition, it was still a question of some doubt whether a rail-way could be produced possessed of such extensive capabilities.

The first undertaking of the kind was the Surrey Rail-way, designed by Mr. Jessop; but the only use as yet made of that road has been for the conveyance, by horses, of heavy goods, at a rate of three or four miles per hour; and in consequence of its passing through a country of little traffic, it has rather disappointed the expectations of its projectors.

The second was the Stockton and Darlington Rail-way, on which steam power was, for the first time, employed to propel passengers, as well as goods, and with a degree of success which began to open the eyes of the public to advantages of which they had not even dreamt, in connexion with rail-way conveyance. It was here proved that by the employment of steam carriages, a speed of from five to eight miles an hour, according to the weight drawn, was readily attainable; and that the expense of this mode of conveyance was one-half, in some instances two-thirds cheaper than any other. Inside passengers were conveyed at the rate of $1\frac{1}{2}d.$ per mile; outsides, $1d.$; and the price of coals, which used at Stockton to be $15s.$ and $17s.$ per ton, was all at once reduced to $10s.$ $2d.$ From the 29th of September, 1825, when this rail-way opened, to the 29th of September, 1826, its receipts increased progressively from £700 to £1500 a month; and in the second year it had drawn to it nearly the whole

carrying trade between Stockton, Richmond, Darlington, Yarm, &c. The turnpike road, too, which may be said to have been thus beaten out of the field, is actually four miles shorter than the rail-way; for to accommodate Darlington and Yarm, a more circuitous line was taken than would otherwise have been necessary.

As early as 1822, and of course long before these favourable results were known, the Liverpool and Manchester Rail-way had been projected by William James, Esq., Civil Engineer, and all the necessary surveys for it made by Mr. Vignoles, another able and intelligent member of the same profession; but in consequence of the strong opposition which was threatened by the whole body of canal proprietors throughout the kingdom, and other causes, the prosecution of the design languished till the progress of the Stockton and Darlington Rail-way towards completion; and the success of some preliminary trials upon it, animated the people of Lancashire with a new zeal in behalf of their own speculation. A deputation of gentlemen was appointed, consisting of Messrs. Ellis, Sanders, and Booth, of Liverpool, and Mr. Kennedy, of Manchester, to proceed to the north to inspect the Stockton and Darlington Rail-way, and also some collieries, in the north of England, where locomotive steam engines have for several years been employed to transport the coal wagons to the nearest land or water communication. The report made by this deputation was so satisfactory, that it was immediately determined to prosecute the plan of the Liverpool and Manchester Rail-way with the greatest vigour: the whole capital required was subscribed within a few weeks; and in the following session of parliament, an act was obtained containing all the requisite legal powers. The act met, as had been anticipated, with a great deal of opposition; but as that opposition had no better foundation than the resistance made by the land carriers of a preceding age to the introduction of canals, it necessarily shared a similar fate. The marquis of Stafford, who was at first its most powerful opponent, became at length so satisfied of the superior advantage which it promised to confer on the country, that his lordship not only withdrew his opposition, but purchased a thousand shares in the concern.

In the summer, or rather autumn of 1826, the formation of the rail-way commenced under the direction of Mr. George Stephenson, of Newcastle-upon-Tyne, who had been appointed by the company to carry the design of Mr. James into execution. The natural character of the country through which the road passes, made the undertaking one of considerable difficulty, as will be readily perceived from a simple detail of the work which Mr. Stephenson had to perform. There were, first, two tunnels, one 2200 yards, and the other 291 yards long, to be excavated under the town of Liverpool, and afterwards six considerable eminences to be cut through; these excavations, too, had mostly to be made through solid rock, (red sandstone,) and amounted altogether to upwards of two millions of cubic yards. While in some parts it was thus necessary to hew out a level with the pickaxe, there were others where the level had to be maintained by raising artificial mounds, (or embankments as they are less

properly called) bridges, and viaducts. One of these mounds, called the Broad Green Embankment, rises to an elevation of 70 feet above the level of the surrounding country; another, which is about four miles long, extends over a moss (Chatmoss) which, three years ago, was scarcely passable even to pedestrians. Of bridges and viaducts the number required to be erected on the line was 25; one of which (the Sankey) was to consist of nine arches of fifty feet span, and another (the Newton) of four arches of thirty feet span; besides which, there were to be 36 culverts of large dimensions, with several of a smaller size. When we consider the great number and variety of these works, the difficulty of some, and the stupendous nature of others, it is really wonderful to think how much has, within the space of three brief years, been accomplished. Both the tunnels, all the bridges but one (that over the Irwell,) and all the culverts, have been already finished; and so nearly have the different mounds and excavations been likewise completed, that of thirty-three miles, (the estimated length of the rail-way) only about four miles remain to be executed. We need scarcely say how greatly all this redounds to the honour of the engineer. So much work of a difficult description could not have been performed in so short a time, (and it is but fair to add so well,) unless the labour bestowed on it had been under most intelligent direction. There are some things which are mere works of time; but here we see art triumphing over time; the labours of the head far transcending those of the hand.

It is now understood that early in the spring of next year, the whole of the rail-way from Liverpool to Old Field Road, near the site of the intended bridge over the Irwell, will be ready for travelling on; and that the opening may not be deferred till the erection of that bridge, it is proposed to erect a wharf and warehouses at Old Field Road, where the rail-way will be considered to terminate, until the continuation of the line into Manchester is completed.

The rails have been as yet laid down on about fourteen miles of the road only; but as this is a matter which requires little time, no delay is apprehended on this account. The sort of rail employed is that called the edge-rail, in contradistinction to the flat rail or tram-plate, now so generally abandoned, where ease of draught is consulted; not however the common edge-rail, but that particular description for which Mr. Birkinshaw, of the Bedlington Iron Works, has a patent. The following description of the construction and advantages of these rails we extract from the Supplement to the Encyclopædia Britannica:—

"The flat rail has been now almost entirely superseded by the edge-rails, which are generally admitted to be decidedly superior; the edge of the bar presenting less friction, and being less liable to clog up with dust and mud, or to be obstructed with stones driven off the road upon the surface of the rails. The edge-rail consists merely of a rectangular bar of cast-iron, three feet long, three or four inches broad, and from one-half inch to one inch thick; set on its edge between sleeper and sleeper, and bearing on the sleepers at its extremities. The upper side of the rail is flaunched out to pre-

sent a broader bearing surface for the wheels, and the under side is also cast thicker than the middle for the sake of strength. But the greatest strength is evidently attained by casting the rail not rectangular, but deeper in the middle than at the ends, to resist better the transverse strain. The ends may be safely reduced to nearly one-third of the depth in the middle, and still be equally strong. To unite the rails together, and at the same time preserve them in their places, and in their upright position, and also to bind them to the sleepers, they are set in a cast-iron socket or chair, which is attached firmly to the sleeper. This socket embracing the extremities of the adjacent rails, which are here made to overlap a little, a pin is driven at once through the rails and through the socket, and binds the whole together. This is the general method of uniting the edge-rails; but the shape and dimensions of the metal chair and of the overlap of the rails are varied according to the judgment and taste of the engineer. Since edge-rail-ways have come into more general use, an essential improvement has been made in their construction by the use of malleable iron, in place of cast-iron, in forming the rails. The advantage of malleable iron rails is, that they are less subject to breakage than cast-iron, a circumstance of importance in this case, where it is not easy to avoid those jolts and sudden shocks which cast-iron is least of all capable of withstanding; and though they should happen to give way, they are easily repaired. They can also be laid in greater lengths, and requiring therefore fewer joints; they can be bent with ease to the curvature of the road: when worn out they are of greater value; and, lastly, their first cost is very little, if at all, greater than that of the cast-iron rails. Malleable iron is, no doubt, less able to stand exposure, decaying more readily under the influence of air and moisture; but hitherto this inconvenience has not been felt; and on the whole, the malleable iron is now decidedly preferred. These rails are laid and joined in the same manner as the cast-iron, only in greater lengths."

The writer then proceeds to decribe Mr. Birkinshaw's improvement—

"An improvement has lately been made in the construction of malleable iron-rails, which promises to be of essential utility. It consists in the use of bars, not rectangular, but of a wedge form, or swelled out on the upper edge. In the rectangular bar, there is evidently a waste of metal on the under surface, which, not requiring to be of the same thickness as where the wagon-wheel is to roll, may be evidently reduced with advantage, if it can be done easily. The bar may then be made deeper, and broader at the top than before, so as with the same quantity of metal to be equally strong, and present a much broader bearing surface for the wheel. The peculiar shape is given them in the rolling of the metal, by means of grooves cut in the rollers, corresponding with the requisite breadth, and depth, and curvature of the proposed rail. Mr. B. recommends the rails to be of eighteen feet in length. We have seen one of these patent rails at Sir John Hope's colliery; and it certainly forms the most perfect iron rail which has hitherto been contrived; combining very simply

and ingeniously, in its form, the qualities of lightness, strength, and durability. It is twelve feet long, two inches broad along the top, about half an inch along the bottom, and still thinner between. It rests on sleepers at every three feet, and at those places the rail is two inches deep, while in the middle point between the sleepers it is three inches deep. All these inequalities, we believe, are produced on the metal by means of the rollers; and this circumstance is well deserving of attention, as it may obviously be applied not merely in the formation of rail-ways, but to a variety of other purposes in the arts. The moulding and shaping of the metal in this manner is quite a new attempt in the iron manufacture, and it is not easy to say how far such an invention may yet be carried by the skill of British artists."

Mr. Stephenson, it will be seen, had good reason for the preference he has given to Mr. Birkinshaw's rails. An engineer of great experience whom we met at the present competition, suggested what we think would be a great improvement in them; namely, that they should overlap at the extremities, in the same way, in fact, as most of the old edge-rails did. The advantage of an unbroken continuity in the bearing surface seems not to have been sufficiently consulted.

The total cost of the rail-way is not expected to be much less than £650,000, or about £20,000 per mile. This is much more than was ever before expended on a rail-way; but the excess is to be accounted for partly by the number of deep cuttings, lofty embankments, &c., which were necessary, and partly by the circumstance, that compensation had to be made to the proprietors of the ground assumed for the purposes of the rail-way, while in most other cases there has been no need of such compensation; rail-ways being, nine times out of ten, constructed by individual proprietors on their own lands, and for their own exclusive benefit. Were the expense, however, even to exceed £650,000—nay, to be even twice or thrice as much—we are convinced there will be revenue enough to yield a handsome return. The traffic between Liverpool and Manchester is probably greater than what exists between any other two points of the kingdom. The one being the principal port for the importation of cotton, and the other the chief seat of its manufacture; this alone serves to unite them in bonds of the closest alliance. The total quantity of merchandise passing between the two towns is stated to be 1200 tons per day; and though it is not to be expected that the same result will take place here as has been exhibited in the case of the Stockton and Darlington rail-way, (for the Liverpool and Manchester rail-way will still have the Irwell and Mersey navigation to contend with, and probably at reduced rates,) yet if only one half of this immense traffic is transferred to the rail-way, it will at 2*d.* per ton each mile, yield an annual income of £52,478 13*s.* 4*d.* The carriage of passengers may reasonably be expected to add to this sum at least £25,000 more.

The profit to be derived by the share holders, forms, however, but a minor consideration, compared with the vast advantages that will result to the inhabitants of Liverpool and Manchester, and indirect-

ly to the nation at large, from increasing the celerity and cheapness of communication between the two towns. But to appreciate duly what is likely to be effected in these respects on this new line, we must pause a moment to reflect on what was the maximum of effect previously realized on the Stockton and Darlington rail-way. It was not more, as we have before stated, than eight miles an hour; and the idea of any thing much beyond that rate was generally scouted as visionary. Mr. Wood, who published his book on rail-ways, after the opening of the Stockton and Darlington rail-way, was pleased to say, "It is far from my wish to promulgate to the world that the *ridiculous* expectations, or rather *professions* of the enthusiastic speculatist will be realized, and that we shall see engines travelling at the rate of *twelve*, *sixteen*, *eighteen*, or *twenty* miles an hour. Nothing could do more harm towards their adoption or general improvement than the promulgation of such *nonsense!*" The directors of the Liverpool and Manchester rail-way appear to have had nearly the same impressions when they offered the present premium of £500 for "the most improved locomotive engine." They stipulated that it should be "capable of drawing after it day by day on a well constructed rail-way, on a level plain, a train of carriages of the gross weight of 20 tons, including the tender and water-tank, at the rate of *ten miles per hour.*" More they did not ask for; and as if to evince how perfectly they agreed with Mr. Wood as to the "nonsense" of expecting more, they selected that gentleman to be one of the judges of their competition.

The proceedings on this first day of the competition are already before our readers. It has been seen from them that Mr. Wood has been spared to see, not only what he declared to be "ridiculous" and "nonsense," reduced to an unquestionable matter of fact, but of witnessing something so much more extraordinary, that had any one hinted it to him in his days of incredulity, he would, we presume, have pronounced it to be absolute madness. The least powerful of the two engines then exhibited, reached nearly the highest degree in Mr. Wood's scale of "nonsense," having gone without any load, at the rate of about eighteen miles an hour; while "The Novelty" of Messrs. Braithwaite and Ericsson actually realized almost double that speed!

"When we consider," says a writer, in the Liverpool Chronicle, "that at this rate of going, Liverpool and Manchester, which are at present near half a day's journey distant, will be brought within an hour's travel of each other; and pass from this fact to the contemplation of the vast changes which so rapid a mode of conveyance will effect in all the relations of society in this quarter of the kingdom, we feel at a loss for examples with which to contrast this great triumph of human ingenuity." But suppose we go a step farther, and estimate what the effects will be, of extending this system of communication over the whole kingdom; what mind is there so comprehensive as to embrace all the important consequences to which it will lead? We think we shall not go too far in saying, that it will produce an entire change in the face of British society. The effect

will be much the same, as if the work-shop of the manufacturer were brought along-side the quay where he obtains his raw material, and whence he sends it forth again in a manufactured shape to the most distant parts of the world; or as if the collieries, iron-mines, and potteries of the heart of England were scattered along its shores. Peculiar local advantages will figure less than they have done in our manufacturing and commercial history; since whatever one place produces, can be so quickly and cheaply transported to another; and instead of our manufactures continuing concentrated in two or three of our large towns—to the great injury of the moral and physical condition of those employed in them, we may expect to see them spreading gradually over the whole kingdom. *Living in the country*, will no longer be a term synonymous with every sort of inconvenience; and it will come to be a mere matter of choice, whether a man of business lives close by his counting-house, or thirty miles from it. The rents of land and houses will not be raised by the change, but they will be equalized; they will be reduced in town, and raised in the country. In proportion, too, as the intercourse of men with each other, and the interchange of commodities between them is thus facilitated, the greater will be the cheapness of every thing; the more our manufacturers will have it in their power to bear up against that foreign competition, by which they are so much endangered. The oftener (to use a common phrase) the penny is turned, the greater the profit; and the quicker a trader's returns, the smaller the capital he requires in business. In fine, we may say of rail-ways in general, as a worthy gentleman is said to have observed of the Stockton and Darlington line, and with ten times greater probability of seeing our prophesy realized—"Let the country but make the rail-roads, and the rail-roads will make the country."

Wonderful as were the results which have suggested these observations, they were abundantly confirmed by the farther experiments which we now proceed to detail.

Second Day, 7th October.—"The Novelty" engine of Messrs. Braithwaite and Ericsson was this day tried with a load of three times its weight attached to it, or 11 tons, 5 cwt.; and it drew this with ease at the rate of 20¾ miles per hour; thus proving itself to be equally good for speed as for power. We took particular notice today of its power of consuming its own smoke, and did not at any time observe the emission of the smallest particle from the chimney.

The weather now became wet, and the rail-ways clogged with mud, which made it necessary to suspend the prosecution of the experiments before the day had half elapsed.

Third Day, 8th October.—Before the commencement of the experiments to day, it was announced that the judges, on reconsidering the card of "Stipulations and conditions" originally issued, had considered them so defective, as to make it necessary to substitute the following:—

"*Trial of the Locomotive Engines.—Liverpool and Manchester Rail-Way.*

"The following is the Ordeal which we have decided each Loco-

motive Engine shall undergo, in contending for the Premium of £500, at Rainhill.

"The weight of the locomotive engine, with its full complement of water in the boiler, shall be ascertained at the weighing machine, by eight o'clock in the morning, and the load assigned to it shall be three times the weight thereof. The water in the boiler shall be cold, and there shall be no fuel in the fire-place. As much fuel shall be weighed, and as much water shall be measured and delivered into the tender-carriage, as the owner of the engine may consider sufficient for the supply of the engine for a journey of thirty-five miles. The fire in the boiler shall then be lighted, and the quantity of fuel consumed for getting up the steam shall be determined, and the time noted.

"The tender carriage, with the fuel and water, shall be considered to be, and taken as a part of the load assigned to the engine.

"Those engines that carry their own fuel and water, shall be allowed a proportionate deduction from their load, according to the weight of the engine.

"The engine, with the carriages attached to it, shall be run by hand up to the starting-post; and as soon as the steam is got up to fifty pounds per square inch, the engine shall set out upon its journey.

"The distance the engine shall perform each trip, shall be one mile and three quarters each way, including one eighth of a mile at each end for getting up the speed, and for stopping the train; by this means the engine, with its load, will travel one and a half mile each way, at full speed.

"The engine shall make ten trips, which will be equal to a journey of thirty-five miles; thirty miles whereof shall be performed at full speed, and the average rate of travelling shall not be less than ten miles per hour.

"As soon as the engine has performed this task, (which will be equal to the travelling from Liverpool to Manchester,) there shall be a fresh supply of fuel and water delivered to her; and as soon as she can be got ready to set out again, she shall go up to the starting-post, and make ten trips more, which will be equal to the journey from Manchester back again to Liverpool.

"The time of performing every trip shall be accurately noted, as well as the time occupied in getting ready to set out on the second journey.

"Should the engine not be enabled to take along with it sufficient fuel and water for the journey of ten trips, the time occupied in taking in a fresh supply of fuel and water, shall be considered and taken as a part of the time in performing the journey.

"*Judges.*—J. U. Rastrick, Esq. Stourbridge, C. E.—Nicholas Wood, Esq. Killingworth, C. E.—John Kennedy, Esq. Manchester.

"*Liverpool, Oct. 6th*, 1829."

We shall not go into a question which has been raised, as to the fairness of the judges making any alteration in the conditions originally promulgated. We have a perfect persuasion that they have

no other desire than to ascertain in the best manner possible, the relative powers of the competing engines, and shall not quarrel with them for any mere irregularity in the mode of their proceedings. The "new" appears to us to be also, on the whole, a "much amended" edition.

In the original "stipulations and conditions," it was first ordered, that "the load attached to each engine should be three times the weight of the engine;" and then, that the load drawn should be equal to "twenty tons, including the tender and water-tank." To reconcile these contradictory stipulations, and to make provision for the case of an engine carrying (as Messrs. Braithwaite and Ericsson's does,) its own fuel and water, and therefore not requiring any tender, the matter of weight was thus arranged in the new conditions: "The tender-carriage, with the fuel and water, shall be considered to be, and taken as a part of the load assigned to the engine." And "those engines that carry their own fuel and water, shall be allowed a proportionate deduction from their load according to the weight of the engine." At first sight these seem very fair conditions; and we have no doubt the intention of them was to do equal justice to all parties. When attentively examined, however, they will be found to have this defect—that they serve to place the steam-carriage, which uses a great deal of water and fuel, on the same level with one which uses very little; though a diminution of fuel and water consumed, is one of the most important improvements which can be introduced into a locomotive engine. As the judges could have no other intention than to place all parties on equal terms, they would have done better simply to stipulate, that "the weight of each engine should be considered to consist of its entire working power; that is, of the whole of the machinery, and the whole of the materials necessary for putting it in motion." The matter would then have been placed on its only just basis; and there would have been no chance of any arithmetical mystification in the results.

Another alteration relates to the pressure of steam which was to be allowed. It was at first stipulated that "the pressure of steam in the boiler should not exceed 50 lbs. on the square inch;" but in the new conditions all that was required was, that "as soon as the steam has got up to 50 lbs. per square inch, the engine shall set out on its journey." We think this alteration was a very expedient one. We know not how the pressure could have been constantly kept at just 50 lbs.; and are quite sure that it would have been very unjust to withhold the prize from a competitor, because he might occasionally exceed that maximum.

Nothing was said in the new conditions as to each engine's "effectually consuming its own smoke;" but this omission could only have arisen from oversight; for the act of Parliament, under the authority of which the rail-way has been formed, orders imperatively that no engine shall be suffered to ply upon it which does not possess this qualification.

Having set these preliminary matters to rights, we now proceed with our narrative of the experiments.

The engine which exhibited on this, the third day, was "The Rocket," of Mr. Stephenson. The trial was conducted in the manner laid down in the "Ordeal" we have just quoted; and it was understood on all hands, that this trial should be considered decisive of its merits.

The engine, with its complement of water in the boiler, weighed 4 tons, 5 cwt. and the load attached to it was 12 tons, 15 cwt., or, including a few persons who rode, about 13 tons. The journey was 1¾ mile each way, with an additional length of 220 yards at each end to stop the engine in, making in one journey 3¾ miles. The first experiment was for 35 miles, which is exactly 10 journeys, and, including all the stoppages at the ends, was performed in 3 hours and 10 minutes, being upwards of 11 miles an hour. After this a fresh supply of water was taken in, which occupied 16 minutes, when the engine again started, and ran 35 miles in 2 hours and 52 minutes, which is upwards of 12 miles an hour, including all stoppages. The speed of the engine, with its load, when in full motion, was, at different times, 13, 13½, 14, and 16 miles an hour; and had the whole distance been in one continued direction, there is little doubt but the result would have been 15 miles an hour. The consumption of coke was on an average about half a ton in the 70 miles.

Fourth Day, 9th October.—To-day a public notice appeared from Messrs. Braithwaite and Ericsson, stating, that in consequence of the alterations made in the conditions of the competition, the trial of their engine in the manner prescribed by the new "Ordeal," had, with the approbation of the judges, been deferred till the following day. The 9th became thus a *dies non* in the competition.

Fifth Day, 10th October.—At the appointed hour this morning "The Novelty" was weighed, and three times its weight assigned to it by the judges. The steam was got up in 54 minutes from the time of lighting the fire. The engine then went one trip by way of rehearsal, when a small pipe accidentally gave way, and it was found necessary to send to Prescot, a distance of two miles, to have it repaired.

In the interval, Mr. Stephenson's locomotive engine was run twice down the course and back, making in all seven miles, but with the whole load taken off from behind, including even the tender carriage with the water-tank and fuel. Thus *stripped for the race*, "The Rocket" performed the seven miles in the space of 14 minutes 14 seconds, being at the rate of 30 miles an hour! This was a rate of speed nearly equal to the utmost which "The Novelty" had achieved; but as it carried with it neither fuel nor water, it is not a speed which it could have long sustained.

Sixth Day, 13th October.—Mr. Acworth's engine, "The Sans Pareil," was pronounced to be this day ready to exhibit its powers. We were informed that, on weighing it, the judges found it to exceed by two or three hundred weight the maximum of six tons; it was, nevertheless, allowed to start to do 70 miles, in the same manner as "The Rocket," with three times its great weight attached to it—that is, upwards of eighteen tons. It was soon manifest that a very powerful competitor had entered the field. For two hours "The Sans Pa-

reil" kept going with great regularity, and during that time completed upwards of 25 miles. It went occasionally, when at its utmost speed, a mile in 4′ 10″ and 4′ 17″, being at the rate of nearly 15 miles an hour. While thus bidding fair—if not to win the prize, at least to come in second best—a similar accident happened to it as befel "The Novelty;" one of the feed pipes burst, and it was rendered for the time incapable of proceeding.

Seventh Day, 14th October.—It being generally understood that this was to be a day of a more decisive trial of Messrs. Braithwaite and Ericsson's engine—that is, according to the new conditions named by the judges—there was almost as numerous an assemblage of spectators as on the first day of the competition.

A fresh pipe had, it appeared, been substituted for the one which failed on the preceding trial; one or two other parts of the machinery that were in a faulty state, had also been renovated; but the engine, with the exception of some of the flanges of the boiler, being, as Mr. Ericsson expressed it, rather *green*, was pronounced in a working state. The load assigned to it by the judges was thus calculated:

	Tons.	*Cwts.*	*qrs.*	*lbs.*
Weight of the engine, without any water or fuel	2	15	0	0
Deduct for weight of tank and coke-baskets, and the quantity of water and fuel deemed necessary for a journey of 35 miles . . .	0	16	1	9
Net weight of "The Novelty's" working power, exclusive of the water and fuel, tank, &c. .	1	18	2	19
× by				3
Given weight to be drawn, dropping the fractional parts	5	16	0	0

The steam was on this occasion got up to a pressure of 50 lbs. in somewhat less than 40 minutes, and at an expenditure of about 15 lbs. of coke.

The engine now started to do the 70 miles for a continuance; but just as it had completed its second trip of three miles, when it was working at the rate of 15 miles an hour, the new cement of some of the flanges of the boiler, yielded to the high temperature to which it was exposed, and the spectators had again the mortification to hear it announced that it was, under these circumstances, impossible the trial could go on.

Messrs. Braithwaite and Ericsson intimated to the judges, that as the joints of "The Novelty" which had given way, could not be restored to a working state before the lapse of at least eight days, and the prolongation of the competition was likely to be attended with great inconvenience to many parties, they would withdraw their engine from any further trial, and "leave it to be judged of by the performances it had already exhibited." The manner in which this virtual conclusion to the proceedings has been announced by one of the Liverpool papers, is so distinguished by its fairness and liberality,

that we cannot deny ourselves the pleasure of making the following quotation from it on the subject:—

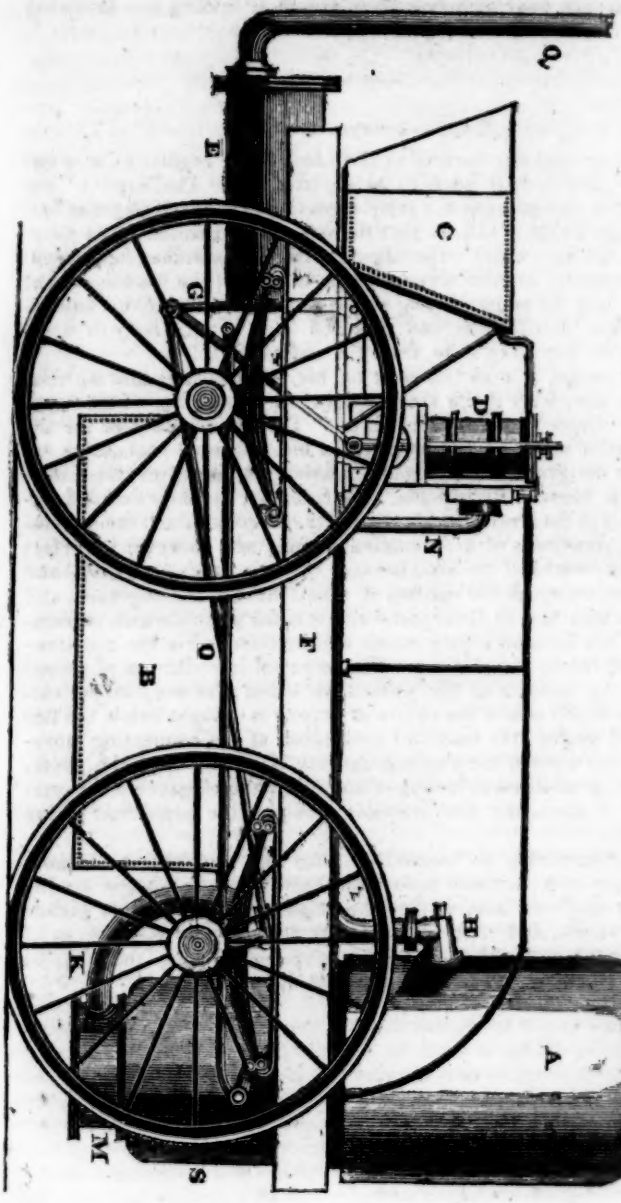
[From the Liverpool Mercury.]

"We may consider the trial of the Locomotive engines as now virtually at an end. It is much to be regretted that 'The Novelty' was not built in time to have the same opportunity of exercising that Mr. Stephenson's engine had, or that there is not in London or its vicinity, any rail-way where experiments with it could have been tried. It will evidently require several weeks to perfect the working of the machine, and the proper fitting of the joints, and under this impression Messrs. Braithwaite and Ericsson have acted wisely in withdrawing, as they have done, from the contest.

"The course is thus left clear for Mr. Stephenson; and we congratulate him, with much sincerity, on the probability of his being about to receive the reward of £500. This is due to him for the perfection to which he has brought the old-fashioned locomotive engine; but the *grand prize of public opinion* is the one which has been gained by Messrs. Braithwaite and Ericsson, for their decided improvement in the arrangement, the safety, simplicity, and the smoothness and steadiness of a locomotive engine; and however imperfect the present works of the machine may be, it is beyond a doubt—and we believe we speak the opinion of nine-tenths of the engineers and scientific men now in Liverpool—that it is the principle and arrangement of this London engine which will be followed in the construction of all future locomotives. The powerful introduction of a blast bellows, the position of the water-tank below the body of the carriage, by which means the centre of gravity is brought below the line of central motion, the beautiful mechanism of the connecting movement of the wheels, the absolute absence of all smell, smoke, noise, vibration, or unpleasant feeling of any kind, the elegance of the machinery, in short, the *tout ensemble* proclaim the perfection of the principle.

"In withdrawing so honourably from the competition, Messrs. Braithwaite and Ericsson have done themselves the highest credit; and they may rest assured that the scientific world will do justice to their efforts, and look with anxiety to a speedy completion of their elegant and compact engine prepared to bear the fiercest 'ordeal' which the judges may please to direct."

Fig. 2. PLATE II.



NOVELTY, No. 1. BRAITHWAITE & ERICSSON.

Description of the Competing Engines.

1. The Novelty.

The external view of "The Novelty," will at once satisfy our readers, that it has not been unmeritedly extolled by all who have seen it, for its singular lightness, elegance, and compactness. All locomotive engines have been hitherto so constructed as to require a separate tender to carry the water and fuel necessary for these operations (we cannot as yet except Mr. Gurney's;) but "The Novelty" includes within itself every necessary accommodation for these purposes, and is, nevertheless, much lighter than any engine on the old plan. "The Rocket," of Mr. Stephenson, which is one requiring a separate tender, weighs 4 tons 3 cwt., while "The Novelty" weighs only 2 tons 15 cwt.; making a difference in favour of the latter of 1 ton 8 cwt.

There have been people so absurd as to say there can be nothing gained by so great a reduction in the weight of an engine as this; that it is "something like substituting a Scotch galloway for a good team-horse; because the lighter the engines are, the weaker." We do not dispute that there is a limit beyond which there is nothing to be gained by lessening the weight of an engine; but we think the performances of "The Novelty" furnish abundant proof that this engine, at least, has not approximated to that limit. The plan, besides, which the judges adopted, of requiring that each engine should draw *three times its own weight*, was calculated to prevent most effectually any delusion on this head.

The advantage gained by such a reduction in weight as "The Novelty" exhibits, is one of no small moment. On the Stockton and Darlington Rail-way, the enormous weight of the engines employed (12 tons, we believe,) has been a subject of great complaint. "The speed of the engines," says a writer on rail-roads, "has been increased on the Darlington road, by substituting wheels of 4 feet diameter instead of 3; but these working upon the plain bars cannot be case-hardened, for fear they should turn round when they have a hard pull; consequently, they are cast of soft iron, which, from the immense weight of the engines, *wears into grooves*, the width of the rails, and with the heavy drag, bites upon the rails, and twists them sideways, which keeps men incessantly upon the line setting them straight: the proof is obvious, because where the *engines* do not work, but the *wagons only*, the rails keep their position, and want no repairs."

The Directors of the Liverpool and Manchester Rail-way having the experience of these results before them, very wisely made superior lightness, one of the foremost qualifications, which should enable an engine to be ranked as "the most improved" of those competing for the prize. They announced that "the weight of the machine, with its complement of water in the boiler, must at most *not exceed six tons*, and that a machine of *less* weight will be preferred, if it drew after it a *proportionate* weight."

The means by which the inventors of "The Novelty" have been

able to combine so much lightness with great power, will be unfolded as we proceed with our description.

The prefixed engraving, No. 1, exhibits the external elevation of the engine. F is the carriage frame; E the end of a circular boiler which passes under the carriage frame towards the steam chamber A; L a hopper to receive the fuel, (which is carried in two small baskets placed on the frame,) whence it falls through a pipe in the centre of the steam chamber A, into the furnace S; M the ash pit; D and N two working cylinders and their slides, (one of each only is seen in the engraving;) B the water-tank; C an air-compressing apparatus, which acts on the furnace through the medium of a pipe that passes under the frame-work, and ends at K; N a pipe for the escape of the heated air; O G the connecting rods which impart the action of the pistons to the wheels.

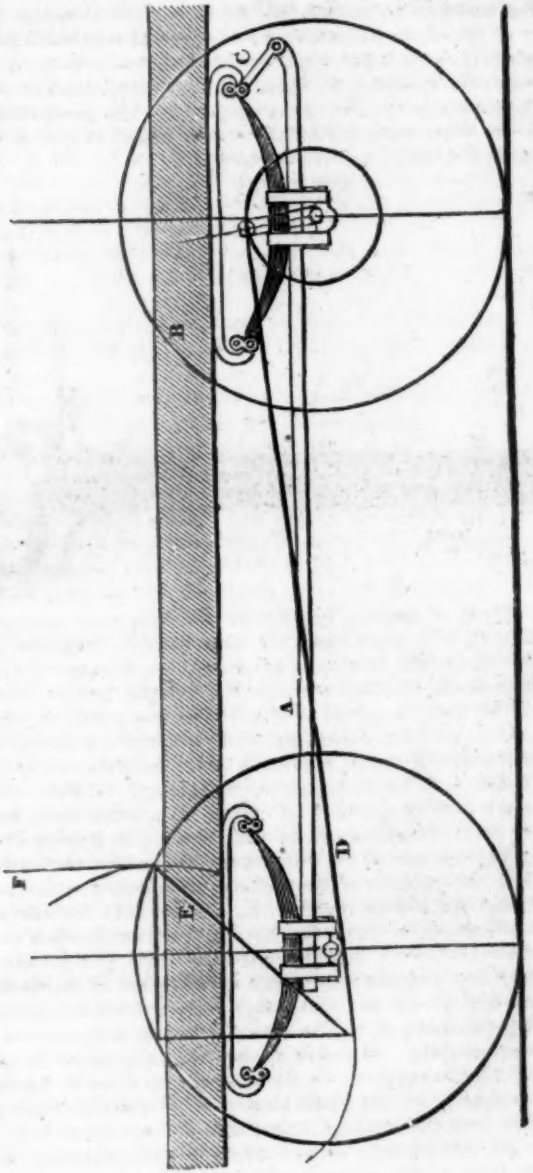
The boiler is made to contain about 45 gallons of water; the diameter of each of the cylinders is 6 inches, and the length of the stroke 12.

The engraving, No. 2, is intended to explain more particularly a very beautiful arrangement of the springs, to which this engine is mainly indebted for its superior steadiness when in action. The axletrees are fixed to the iron rod, A, and a sling, C, is introduced to obviate that side action which would otherwise take place between the rod and the carriage frame, B. Again, to prevent the action of the springs from interfering with the action of the engine, the connecting rod, D, is placed as nearly in a horizontal position as possible; the connecting rods are moved by bell cranks, E, which are connected by slings, F, with the piston rod.

The wheels are of the excellent description patented by Messrs. Jones and Co., and the choice of them by Messrs. Braithwaite and Ericsson, is as strong a tribute as could well have been paid to their merits. From the peculiar manner of their construction, they act with the least possible interference from the weight of the engine, and being perfectly cylindrical, bear equally with their whole breadth on the rails. The lightness for which these wheels are famed, is not in this instance so remarkable, "The Novelty" being itself in its main parts so light, as to throw other things in comparison with it into the shade. Of the total weight of 2 tons 15 cwt., we believe 18 cwt. falls to the share of the wheels.

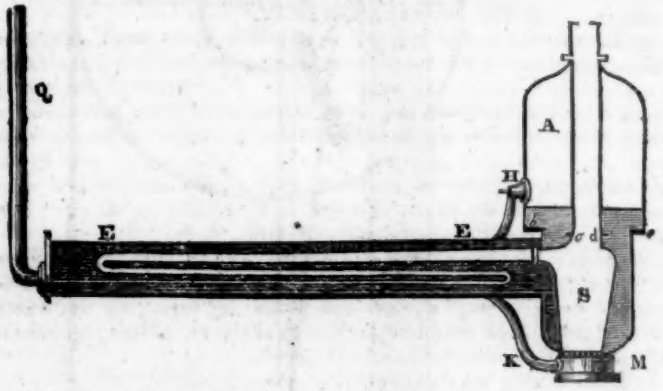
Having described the external appearance of this engine, we now proceed to explain its interior construction: for the better understanding of which, we present our readers with a rough, sectional view, (drawn from recollection) of the more material parts.

NOVELTY. No. 2.



S, is the furnace, which is supplied with fuel from the hopper, L,* (see the annexed engraving, No. 3,) through the vertical tube in the centre of the steam chamber, A; the heated air from this furnace passes off through a flue, which is made to wind twice or thrice up and down the cylinder, E, E, and gradually diminishes in diameter till its termination in the escape pipe, Q. The parts shaded in the sketch are those occupied by the water, which, it will be observed, surrounds the boiler as well as the flue.

NOVELTY. No. 3.



The extent of surface exposed to the action of the heat by this arrangement, is a great deal less than in other engines; and were the heat left to circulate as in other engines, through the agency of what is commonly called atmospheric draught merely, there would probably be nothing gained in respect of the quantity of steam generated. But instead of depending on the atmospheric draught, Messrs. Braithwaite and Ericsson make use of the bellows-sort of apparatus (CK) in No. 1, to force the heated air through the flue; and by thus supplying a greater quantity of caloric in a given time, they obtain an effect precisely analogous to what would result from doubling or quadrupling the size of the furnace and the extent of the flue. Nor is this all; the quantity of atmospheric air which is introduced under and through the fire by the pipe, K, has not only the effect of forcing the heated air onwards through the flue, but is itself a source of heat, equivalent to the employment of so much additional coke. It is in these two circumstances—the acceleration of the draft and the supply of fuel (if we may so speak,) derived from the atmosphere—that the great merit of "The Novelty"—the secret of its vast superiority—consists. It makes up, by the quickness of its operations, for the diminutiveness of its dimensions, by what it borrows from the air around it for the small supply of coke which it carries.

Neither does the rapidity with which the current of hot air passes through the flue constitute any exception to the efficiency of the process; for such is the aptitude of small circular pipes, like this, to

* Omitted in the engraving.

abstract heat from any fluid conveyed through them, and to part with it again to surrounding substances, that little, if any, caloric is suffered to pass unappropriated.

The flue is made to diminish *gradually*, because the heated air cools in its passage through it, and gradually requires less and less vent. It has also a downward inclination given to it, as represented in the sketch—such, that if a marble ball were dropped in at the furnace end, it would roll rapidly through all the convolutions of the pipe to the other extremity; and the object of so constructing it, is, that any dust which may arise from the furnace, may have always a descending passage to escape by.

In the specification of the patent which Messrs. Braithwaite and Ericsson have taken out for this mode of generating steam, mention is made of two air-forcing pipes: one by which atmospheric air is forced on to the *top* of the fuel in the furnace; and another through which the air is forced under the bottom of the fuel. A double supply of air, however, is only considered necessary where coal is the fuel employed, in order to insure its combustion more effectually; and where fuel of the purity of coke is made use of, as in "The Novelty," the upper pipe is dispensed with.

There are, of course, cocks to regulate the transmission of air through the pipe K; also safety-valves to the boiler and steam chamber; but these, as well as the feed pump for supplying the water from the tank, have been left out in our sketches, as being unnecessary to illustrate the principle of the engine.

It is now fitting we should explain more particularly, than has yet been done, the cause of those accidents by which some doubt has been for the moment thrown on the soundness of that principle. The engine, it appears, had been got up in a hurry—having been begun and finished within the short space of the six weeks immediately preceding the competition, and had never been subjected to any sort of proof. It was not to be expected, therefore, that it should be found perfect at all points. The part which was first observed to perform its office insufficiently, was the pipe of the feed pump; and the consequence was, that the water, which it is the business of this pump to keep always at the height marked in our sectional sketch, sunk below the level of the flue of the furnace; which flue being thus left exposed to a dry temperature of high elevation, gave way near to the flanch. In order to get at this damaged part of the flue, it was necessary to lift off the steam chamber, A, and for this purpose to undo the joints *b*, *c*, *d*, and *e*. To renovate the flue was an easy matter, but not so to restore the joints all at once to the state in which they previously were. The cement with which they were re-secured, would have required a week at least to harden properly; but it was as yet scarce twelve hours old when the engine started to perform the last task assigned to it. As might have been naturally expected, the joints yielded to the high temperature (300°) to which they were exposed; the steam began to escape at all points; and the efficiency of the engine was for the time and occasion, at an end.

The impartial reader will see nothing in any of these mischances tending in the least to discredit the principle on which "The Novelty" is constructed. It was not the peculiarity of that principle which caused either the defective feed pipe to go wrong, or the unduly exposed flue to crack, or the green joints to give way. The principle worked admirably, as long as every part of the machinery stood firm, and had fair play: nor can a doubt be reasonably entertained, that had the engine been previously proved (as cannon and muskets are proved,) and been kept in good working order, it would, upon the trial for a continuance, have fully realized the expectations which its previous performances had excited. The grand point on which its superiority depends, had already been fully established; namely, that it can generate a greater quantity of steam, in a given time, than was ever before produced by any apparatus of equal capacity. No further trial was wanted to show that what it could do for one hour in this respect, it would do for any number of hours. There might be errors committed in estimating the quantity of water and fuel requisite for a long journey; but there could be none in assuming that the power of the air-forcing pump to augment the heat, and accelerate the circulation of the heated air, must of necessity remain the same, whether the journey is short or long. Every thing needful for the manifestation of the master principle of the engine had been done; and all that was left unaccomplished, was but such a practical display as might convince those who, unable to appreciate principles, look only to results.

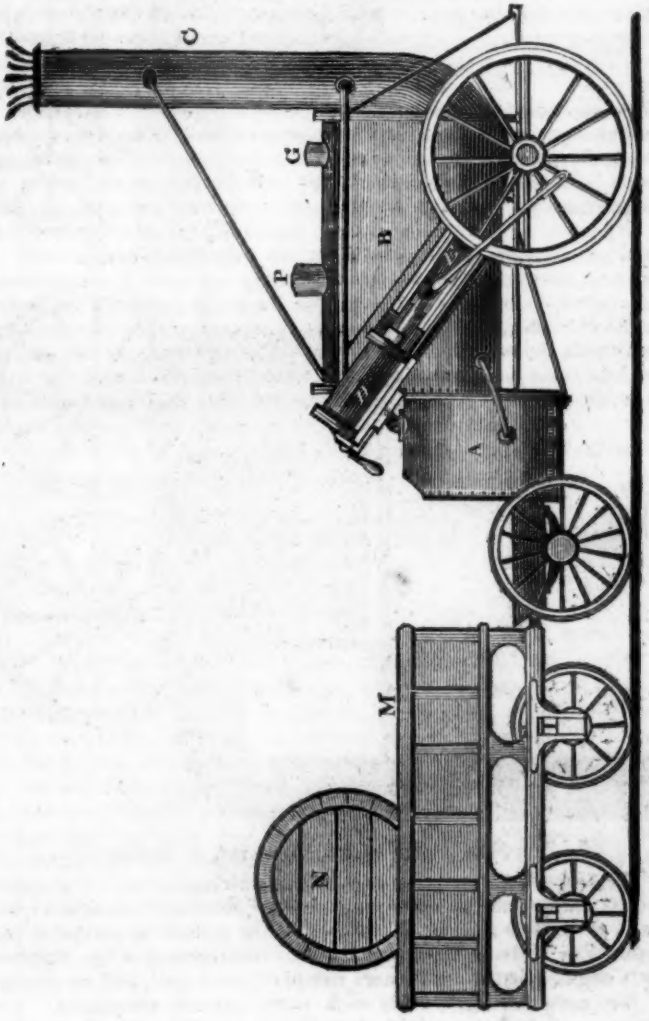
Second Engine.—The Rocket.

Annexed is an external elevation of this engine and its tender; but on a scale one-half less than our engraving of "The Novelty." The furnace, A, is two feet wide by three feet high; the boiler, B, is six feet long and three feet in diameter. The furnace, like that of "The Novelty," has an external casing, between which and the fire-plate there is a space of three inches filled with water, and communicating with the boiler. The heated air from the furnace is circulated through the boiler by means of twenty-five copper pipes of three inches each in diameter, which have their termination in the tall chimney, C. P and G are safety valves. The steam eduction pipes pass into the flue C. D, one of two steam cylinders which have an angular inclination towards the wheels, and embrace, like two arms, the boiler between them. E, one of the connecting rods which give motion to the wheels; *a*, the slide of the piston of the cylinder seen in the engraving; and *o*, one of the two escape pipes. M, is the part of the tender appropriated to the carriage of fuel; N the water cask.

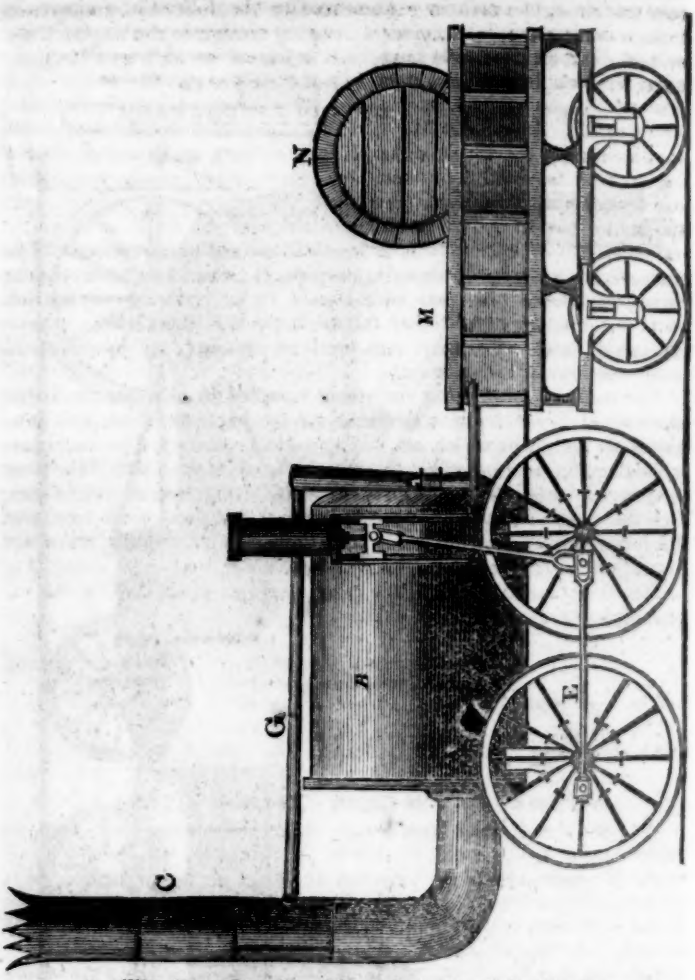
The performances of this engine indicate a very abundant and well sustained production of steam; but the extent of surface which it has been found necessary to expose to the heat, in order to obtain that effect, the great size of all the parts, and the quantity of fuel required, are faults which even a still more copious generation of steam would scarcely compensate. It is not by means of its heavy weight alone that such an engine would operate injuriously on the

rails. The chimney, from its great height—a height necessary to obtain that draught which in "The Novelty" is produced by means of the air-forcing apparatus, gives a swaying motion to the engine from side to side; and the rails have thus a lateral as well as a longitudinal force applied to jerk them out of their places.

THE ROCKET. BY MR. STEPHENSON.



THIRD ENGINE.—THE SANS PAREIL.



3. *The Sans Pareil.—Mr. Ackworth, of Darlington.*

The preceding engraving presents an external view of this engine and its tender, on the same scale as the "Rocket," namely, a quarter of an inch to a foot. It exhibits in its general appearance, particularly in its large dimensions, a near resemblance to Mr. Stephenson's engine; but is much more compactly arranged, and on account of this compactness, travels with much greater steadiness. The furnace and boiler are not placed head-and-tail-wise, as in "The

Rocket," but form together the main body (B) of the engine, being constructed in the manner represented in the following diagram:—

A, is the furnace, *b*, *b*, the flue or tube through which the heated air passes in the direction marked by the arrows, to the chimney, C. The boiler, *o*, *o*, *o*, *o*, surrounds the furnace and flue. The working cylinder, the connecting rod, &c. are similar to those of "The Rocket," with the exception of being vertical instead of horizontal. The waste steam passes into an external pipe, G, which has an ascending direction given to it towards the chimney, C; so that whatever portion of it is there condensed may fall back through the vertical branch pipe, at its lower extremity, into the feed pumps, (only one of which is represented in the drawing.)

The mode of generating the steam adopted in this engine, is the same which Trevethick introduced as far back as 1804, and possesses all the merit which has been generally conceded to that plan, without exhibiting any effort to obviate the objections that have been so generally made to it. The furnace and boiler are of simple construction, and of unquestionable efficiency; but their great size, and the large supply of fuel and water they require, render them but ill adapted to the purposes of a locomotive engine.

The comparative speed of the three engines, as verified by the recent experiments, stands as follows:—

	MILES PER HOUR.	
	With a load equivalent to three times the weight of the engine.	With a carriage and passengers.
The Sans Pareil,	12½	—
The Rocket,	12½	24
The Novelty,	20¾	32

[From the Baltimore Gazette of December 30, 1829.]

We have seen a letter from a most respectable house in Liverpool, under date of the 23d ult. to another in this city, which communicates the particulars of an experiment made on the preceding day, on the Liverpool rail-road, with wagons of burden, on the principle of our ingenious countryman, Mr. Winans' invention. The result is detailed in the following extract:—

"A trial was yesterday made of Mr. Winans' wagons upon the rail-road, drawn by 'The Novelty' steam engine, (Braithwaite and Ericsson's) which resulted as follows:—

Weight of engine,	3 tons.
" " load,	27 "
" " wagons,	5 "
Total	35 tons.

"This load was drawn 13 miles per hour.

"At the same time Mr. Stephenson's improved wagons were tried, and the result, at the same speed, was as follows:—

Weight of engine,	3 tons.
" " load,	16 "
" " wagons	7 "
Total	26 tons.

"From this experiment, it appears, that as regards the load transported, the effect was as 16 to 27 tons, or about 68 per cent. in favour of Winans' car.

The stock of the Liverpool and Manchester Rail-way is now £180 for £90 paid."

[TO BE CONTINUED.]

On Colouring Gold Works Yellow, with some experiments on Gilding Bronze. By F. P. CASTELLANI.

[From the *Giorn. Arcadico*, 1826.]

EXPERIENCE has shown the author, that gold may be perfectly coloured, in a very short time, in a very simple manner, and with a uniform result, by certain liquids containing a solution of gold, and other saline and acid substances; owing to the chemical action, which, according to the opinion of the late Sir H. Davy, is exercised in the direct ratio of the electrical state of the substances exposed to it. It is then easy to perceive that this condition of the elements which compose the bath, contributes to oppose a too rapid electric action; and thus the precipitation of the gold is effected in a regular and perfect manner. Laying aside the task of exposing the theoretic ideas of the author, we shall proceed to make known his processes.

Of all the liquids proper for colouring gold, the two following appear to be the best.

First Mixture.

Hydrochloric (muriatic) acid at twenty-two degrees,	10 grains.
Sulphuric acid of commerce,	4
Crystallized boracic acid,	2
Pure water,	150

Second Mixture.

Acid hydrochlorate of liquid alumina,	13 grains.
Crystallized sulphate of soda,	4
Crystallized boracic acid,	3
Water,	150

Into either of these mixtures must be put twenty grains of a neutral solution of hydrochlorate of gold, in order to form excellent baths for giving to gold a yellow colour. The following is the manner of operating.

M. Castellani employs a furnace, somewhat like that used to roast

coffee; a circle of iron, with three feet to it, is enclosed in the sides of this furnace, upon which is placed a matrass having a very large mouth; and as its lower part is intended to come into contact with the fire, so it should be well defended with lute. All being thus disposed, we pour into the matrass the solution of gold, and when it has just attained the boiling point, we plunge into it the different pieces of gold work, by means of a wire of gold; these pieces of work must have previously been well cleansed, in the usual manner. At the end of some minutes after their immersion, we plunge in a copper wire, and which must remain until we perceive that the gold begins to assume a dark tint. We must then withdraw the copper wire, and leave the articles in the liquor, until they have acquired the yellow colour desired. We then plunge them into warm water, acidulated either by the sulphuric or acetic acid, in order to dissolve any particles of oxide of copper which may possibly adhere to them; they are lastly to be washed in warm water, and well dried, by placing them near to a charcoal fire.

Generally a single operation is not sufficient to produce the desired colour, and as a long continued immersion would be injurious, on account of the oxide of copper which is produced, so it is much better to repeat the process, until we have obtained the desired colour. In general, it is better to effect the colouring by many repetitions, in order to have it fine; as if the immersion be too long prolonged, the pieces become red, and must be cleansed anew, and submitted to new operations.

These mixtures are employed for those gold works which contain a fourth of their weight of copper; but it is probable, that the proportions of the principal constituents of these liquids may require altering, according to the quantity of copper in other alloys. And we may add, that the immersion of the pieces of gold work may be continued longer as they are more bulky or thicker; but the time must be shortened, when they are small, thin, or formed of wire, &c. When the bath which contains the gold in solution is no longer good, or begins to become weak, after many colourations, we may either add some drops of the solution of gold, or in case they may be required, some portions of the other constituents of the liquid. When the copper wire is found to be covered with a little metallic gold, it must be changed for another, in order that it may exert its electric action. If you would obtain an intense yellow colour, you must repeat the immersions, and the contact of the copper, many times; but if only a pale colour be required, it is sufficient, after the last immersion, to boil it, without touching it with the copper wire.

Bronze experienced the same effect as gold, after it had been coated with an amalgam of gold, and the mercury had been driven off by heating it. But the gold received a disagreeable and unequal yellowish white tint; the author blames the mixtures employed, in which there was much sulphate of copper, which, as M. Ribaucourt has observed, will never answer. He therefore proposed to adopt a mixture containing a salt of gold, nearly similar to the two preceding ones; and after some experiments which he has made, he is led

to conclude that they will be attended with good results. But, as his experiments are not yet concluded, it is out of our power to describe his process, or to give recipes for the mixtures.

On transferring Prints to the surface of Wood, and either reversing them or not. And on making and applying hard White Spirit Varnish.

[From *Journ. de la Société du Bas. Rhin.* 1827.]

This process is very analogous to that formerly employed in transferring prints to the surface of glass, and to the back of which prints colours were afterwards applied, so as, in some degree, to imitate oil pictures. Here, however, they are applied upon the surface of wood, such as cornel, sycamore, horse chesnut, satin wood, *aer wood*, or the curly veined maple, &c., which is afterwards to be varnished.

The wood having been planed smooth and even, is to have a slight coat of the best glue applied upon it; when this has become dry, it must be rubbed with Dutch rushes, or glass paper, to remove the small filaments which the glue had raised, and render the surface uniform. We then apply a layer of white alcoholic varnish, taking care not to cross the marks left by the brush, and pass as few times as possible over the same place; it is then left to dry. We afterwards apply, in succession, three, four, five, or six, other coats of varnish upon it, according as the varnish may be thinner or thicker.

The edges of the print are then to be cut close to the engraving; and it must be laid upon a proper table, with the impression downwards; it must be then uniformly moistened with a wet sponge, or in any other manner. When it has been equally and thoroughly wetted, it must be placed between two leaves of blotting paper, in order to remove any drops of water. We then apply another coat of varnish over the surface of the wood; and, before it is become dry, apply the moistened print upon it, with the engraving downwards. In order to do this, we lay one edge of the print first upon the surface of the wood, holding it suspended by the other hand, and wipe successively over the back of the print, in such a manner as to drive out all the air, and prevent the formation of blisters. We then lay a sheet of dry paper upon it, and pass a linen cloth over every part of the print, in order to fix it securely upon the varnish. We must take great care to place the print steadily upon the varnished wood, lest we may make a false or distorted impression of it. We then leave it to dry; and when it has become thoroughly dry, we moisten the back of the paper with a sponge, and pass or lightly rub the fingers backwards and forwards over it repeatedly, so as to remove the moistened paper in small rolls curled up. When, however, the marks of the picture begin to appear, we must take care lest, in rubbing, we should remove any portion of the paper upon which the impression is taken. When we find, therefore, that we can remove

no more of the paper, without incurring the risk of injuring the print, we suffer it to dry; in drying, the engraving will entirely disappear at the back of the print, it remaining covered with a slight film of paper. But, on again giving one coat of varnish, it will be rendered entirely transparent. It must then be again suffered to become quite dry. If by chance we have raised any small parts of the engraving, we must retouch those defects with fine lamp-black and gum water, before we proceed to varnish, as we have before mentioned; great care must be used in laying on a second coat of varnish, passing rapidly over the retouched parts. When this last coat of varnish is become perfectly dry, we may remove any projecting part of the paper, and polish it with Dutch rushes, steeped for three or four days in olive oil; we then remove the oil by rubbing with a fine linen cloth, and sprinkle it all over with starch or hair powder; this will absorb the least remains of the oil, and we remove it by first passing the palm of the hand over it, and then by carefully wiping or rubbing it with a fine linen cloth; we next apply three or four more layers of varnish, taking care to let it dry between each coat. When the last coat is become quite dry (in three or four days' time,) we polish the varnish with a piece of fine woollen cloth, and chalk or whiting of the finest kind.

In order to prepare this fine chalk, we must grind the ordinary chalk in a mortar, with a little water; and when it is well ground, we add more water, and pour it into a glass vessel, suffering it to remain at rest five or six minutes, it will then have deposited its coarser particles. We then decant the liquid, which holds in suspension the finer particles of the chalk; let it rest, and when the water has become clear, we pour it off, and shall find the sediment in the form of a paste, and which we use to polish the varnish with. We must take care to use it in the moist or wet state; as, if it becomes dry, it is impossible to preserve it in the minutely divided state, and we should run the risk of polishing the varnish in streaks. If, however, we would have the varnish still more shining, we must wash off all the remains of this fine chalk with water, and polish it with the palm of the hand, only slightly moistened. But to have it still more brilliant, after having washed away all the chalk, and suffered it to become quite dry, we must pass all over it a thin coat of varnish, either in the sunshine, or near a warm stove, in order that the varnish may be extended uniformly upon the surface.

White Spirit of Wine Varnish.

Rectified spirit of wine, - - -	24 ozs.
Fine sandarach, - - - - -	4
Fine turpentine, - - - - -	1
Spirit or oil of turpentine, - - - -	1
Camphor, - - - - -	2 *gros.*

We must select the most transparent sandarach, and that which is the least yellow; but if it be not of the best possible kind, we must wash it in a weak lie of potash, and then in a large quantity of water, and let it dry perfectly. For the quantity above directed, we

must take a bottle of white glass, well dried, and of the capacity of forty ounces; and, after pulverizing the sandarach, we reduce the particles of it to a kind of thin paste, by triturating it with some of the spirit of wine, and put it by degrees into the bottle. We likewise mix the turpentine and the oil of turpentine together, by rubbing them up in the same mortar; and when the turpentine becomes more liquid, we may increase its liquidity by adding some spirit of wine to it, and pour it into the bottle, when we must shake it for some time, in order to mix the materials well together. We likewise put the camphor into the mortar, and beat it up with some drops of spirit of wine; we then add a larger quantity of the spirit, which will entirely dissolve it; this is then to be poured into the bottle, and it must be again well shaken for some time, in order thoroughly to mix all the materials together. The bottle must then either be exposed to the heat of the sun, or that of a warm stove, for ten or twelve days, taking care to shake it from time to time, and to unstop it, in order to suffer the vapour to escape; but finally it must be close stopped, and the varnish kept for use.

On applying the Varnish to Wood.

We place the subjects, which we would varnish, either in the sunshine, or near a warm stove. We then apply six, eight, or ten coats of varnish. We must take care never to apply a second coat until the former one has become quite dry. If we would give the piece of work a fine lustre, we may polish the varnish, after the last coat is become quite dry, with finely washed chalk, applied whilst wet upon a soft woollen cloth. Or we moisten the palm of the hand, and rub the varnish with it, until it has acquired a perfect polish. Before applying the varnish upon wood, however, we must always prepare it by a coat of glue.

On fixing Prints upon Wood, in their natural position, and removing the Paper from them.

We select a surface of any kind of wood, the size of the print; we then moisten a piece of thick drawing paper, of a proper size, and apply upon its surface a layer of thin glue; we then suffer it to dry, and give it two or three more coats of the same glue, letting it dry between each coat; we then prepare the surface of this paper, to receive the print, in the same manner as the wood was prepared, as described in the first part of this article, by coating it with several layers of spirit varnish. We then apply the print, and conduct the operation exactly as before, to the period when we remove the last portions of oil by means of starch, and give several layers of varnish. The wood being then prepared to receive the print, by the coat of glue, and several layers of varnish, applied in the manner before described, we fix upon it the leaf of drawing-paper, bearing the print upon its prepared surface. We then apply a coat of varnish to the wood, and affix the prepared paper and print upon it, whilst it is still tacky; and so as to prevent the forming of any blisters or air-bubbles between them. When we think that the varnish is become hard, with

the help of warm water and a sponge, we moisten the glued paper which covers the whole; we then remove that paper, which readily comes off; and with the aid of the warm water and the sponge, we cause the glue to disappear from the varnished surface of the print; we then polish it with prepared chalk, and finish it, as before stated. This process may also be employed, not only to apply prints upon the surface of wood, but also upon metals, &c.

Chromate of Zinc as a Pigment.

M. Lampadius directs that chromate of zinc should be prepared by adding a solution of chromate of potash to one of sulphate or muriate of zinc. There is not at first any precipitation, but on adding more chromate, a deep yellow-coloured precipitate is formed. A yellow liquid remains, which being decomposed by solution of potash, also gives an abundant precipitate, but of a paler colour: these colours may be employed either in oil or with varnish.

[*Philosophical Magazine, Jan.* 1830.

Green Lake prepared from Red Cabbage.

M. Lampadius states, when a hot infusion of red cabbage is treated with a solution of acetate, or still better, subacetate of lead, a very fine deep grass-green lake is obtained. Muriate of antimony, with a similar infusion, gives a rose-red precipitate. Infusion of cabbage may be employed to dye cotton and linen of these colours, after having used acetate of lead and muriate of antimony as a mordant.

[*Ibid.*

Detection of Adulteration in Chromate of Potash.

M. Zuber states that this salt is frequently adulterated with muriate or sulphate of potash; and he proposes the following method of detecting them: Add a large excess of tartaric acid to the chromate of potash to be tried, the chromate will be decomposed, and acquire, in about ten minutes, a deep amethyst colour: It will now, if pure, form no precipitate with nitrate of barytes or silver, by which means the presence of muriate or sulphate of potash may be ascertained. [*Annales de Chimie, Sept.* 1829.

Improvement in the Smelting of Iron.

Heated air for blast furnaces has been used for some time at the Clyde Iron-works, and with great success. Experiments have proved that iron is smelted by heated air, with three-fourths of the quantity of coals required, when cold air—that is, air not artificially heated—is employed for that purpose; while the produce of the furnace in iron, is, at the same time, greatly increased. All the furnaces at

Clyde Iron-works are now blown with it. At these works, the air, before it is thrown into the blast furnaces, is heated 220° of Fahr. in cast-iron vessels placed on furnaces, similar to those of steam engine boilers. It is expected that a higher temperature than 220° will be productive of a proportionably increased effect. But this is the subject of experiment. It is supposed that this improvement will accomplish a saving in Great Britain, to the amount of at least £200,000 a year. [*Edinburgh Philosophical Magazine.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Query, respecting heating water by steam and the Solar ray.

Doctor Jones,—Sir, I take the liberty to hand you the following *query*, to which I will thank you to give a place in your valuable journal—and I shall be much gratified if some of your learned correspondents will furnish a solution; as I have examined the several Encyclopædias, and searched most of the scientific works that treat upon evaporation, caloric, steam, &c. without being able to discover any facts that will assist me in forming any satisfactory conclusions.

Yours,

Enquirer.

Query.—Suppose there to be two vats, whose surfaces are equal—for example—let them both be 60 feet long, by 15 feet wide, and 12 inches deep—each to receive the same quantity of water exactly, viz: 900 cubic feet; one of the said vats to be covered with an awning or roof, so as to exclude the sun's rays, but to be open on the sides and ends, and so high above the top of the vat as to admit of the free circulation of the air, and the ready escape of the vapour that may be thrown off during evaporation—the other vat to be open or uncovered, and to receive the full rays of the sun; but both vats to be so fitted with copper pipes, passing through the water in each, that steam may be directed at pleasure into either; thus arranged, suppose, on the 22nd day of June, (a clear day, having a dry atmosphere, and the dew point to be 59 deg. Fahr.) that the water in the uncovered vat is permitted to receive the full force and heat of the sun's rays, and that, at 1 o'clock, P. M. the water has acquired the temperature of 110 deg. of Fahr. In the other or covered vat, the steam is to be communicated to the water from a boiler, but in such *regulated* quantity, as only to raise the temperature to 120 deg. of Fahr. The water in the two vats being at that hour, at the respective temperatures of 110 deg. and 120 deg. Suppose the steam to be withdrawn from the covered or steam vat, and to be directed (in the same *regulated* quantity,) into the water which is in the open or sun's vat, and already heated to the temperature of 110 deg.—to what degree will the united heat of the sun and steam elevate the temperature of the water in the sun's vat? (allowing a sufficient time for the steam to communicate to the water the maximum of heat, which it was permitted to impart to the water in the steam vat;) or, in other words—what will be the united power of the two sources of heat, when directed into the water in the sun's vat? and by what *rule* can the same be demonstrated?